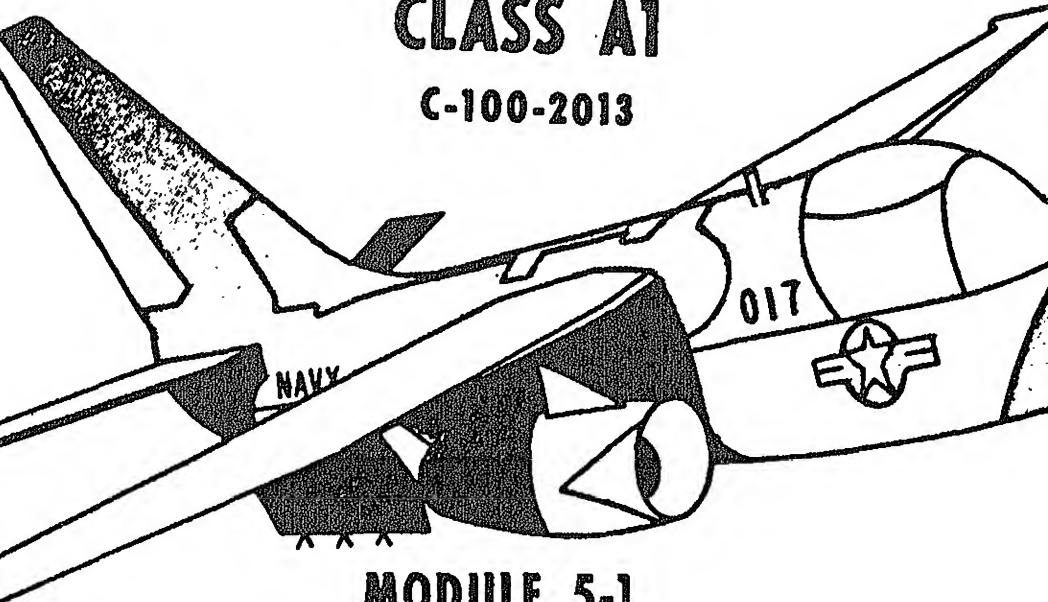


AVIONICS TECHNICIAN COURSE

CLASS A1

C-100-2013



MODULE 5-1

MIMS AND SECURITY OF SYSTEMS IN AIRCRAFT

CNTT-M1186 (REV. 8-84)

**PREPARED BY
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PREPARED FOR

AVIONICS TECHNICIAN COURSE, CLASS A1

UNIT 5

MODULE 1

LESSON TOPIC 1

PURPOSE AND FORMAT OF MAINTENANCE INSTRUCTION MANUALS

LESSON TOPIC 5-1-1

PURPOSE AND FORMAT OF MAINTENANCE INSTRUCTION MANUALS

In this lesson topic you will study the purpose and format of the Maintenance Instruction Manual (MIM) as used in an operating ship or squadron of the U. S. Navy. You should thoroughly understand the purpose and format of the Table of Contents, List of Illustrations, List of Tables, and the information contained in the five sections of the MIM.

Learning objectives for this lesson topic are as follows:

Given a list of statements, select the statement which correctly describes the purpose of a Maintenance Instruction Manual (MIM).

Select from a list, the parts of the MIM that provide the listing of paragraph numbers, figure numbers, table numbers, and page numbers.

Select from a list of statements, the information contained in the Introduction Section of the MIM.

Select from a list, the types of information contained in the Description and Operation Section of the MIM.

Select from a list, the information you would not look for in the Organizational Maintenance Section of the MIM.

Select from a list, the information contained in the Intermediate Maintenance Section of the MIM.

Select, from a list of items, the information contained in the Charts and Diagrams Section of the MIM.

: All objectives in this lesson topic must be accomplished with 100 percent accuracy, unless otherwise stated.

Before beginning this lesson topic, carefully review the "List of Study Resources". Keep in mind that your learning advisor can be your most valuable learning resource. Always free to consult with him if you have problems or questions.

PURPOSE AND FORMAT OF MAINTENANCE INSTRUCTION MANUALS

To learn the material in this lesson topic, you may choose according to your experience and preferences, any or all of the following written lesson topic presentations.

WRITTEN LESSON TOPIC PRESENTATIONS IN MODULE BOOKLET:

1. Lesson topic summary.
2. Programmed instruction form of lesson topic.
3. Narrative form of lesson topic.
4. Lesson topic progress check.

ADDITIONAL MATERIALS REQUIRED FOR SUCCESSFUL COMPLETION OF LESSON TOPIC:

Student Response Sheets.

Programmed instruction response sheets.

ENRICHMENT MATERIAL:

Aviation Electronics Technician 3 & 2, NAVPERS 10317-D, Chapter 69.

All the resources listed above are available and may be used as you see fit. Your learning supervisor represents a most valuable learning resource. Use him when you need help. It is not necessary to use all the resources to achieve the learning objectives for the lesson topic. The lesson topic progress check is your means of determining when you have achieved the objectives. The progress check may be taken at any time and is graded by you. If you fail to achieve any objective at the lesson topic level, you will plan and accomplish your own remediation. If you need help in remediation planning, consult your learning supervisor.

The purpose of the Maintenance Instruction Manual is to provide the information and instructions required to perform maintenance on an aircraft's systems in the aircraft.

In aid in the use of the MIM the following three parts are used to locate specific paragraphs, diagrams, tables, and page numbers.

- a. Table of Contents.
- b. List of Tables.
- c. List of Illustrations.

The MIM is typically divided into five basic sections. Section I, Introduction, contains a general description of the manual, a list of technical directives, and all applicable publications. Section II, "Description of the Aircraft", contains the following information:

- a. Electrical specifications.
- b. Component complement.
- c. Handling and installation.
- d. Operating instructions.
- e. Description of aircraft or equipment.
- f. Theory of operation.

Section III, "Organizational Maintenance", contains the following information:

- a. Equipment supplied tables.
- b. Equipment required but not supplied tables.
- c. Daily and preflight inspection procedures.
- d. Operational checks.
- e. Major test point tables.
- f. Removal and reinstallation of major units.
- g. Frequency alignment.

Section IV "Intermediate Maintenance," contains secondary and minor test point tables used as a guide for performing minimum performance test, troubleshooting, or alignment.

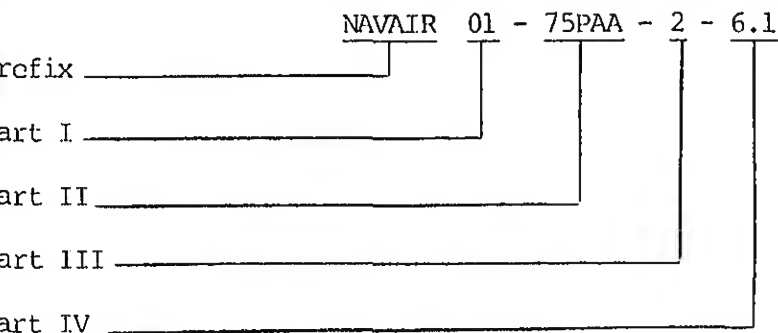
diagrams, and function block diagrams for the units covered in the Lesson Topic.

At this point, you may take the Lesson Topic Progress Check. If you answer all self-test items correctly, go on to the next Lesson Topic. If you do not, select and use another medium of instruction for the Lesson Topic: Programmed Instruction, Narrative, or consultation with Learning Supervisor, until you can answer all self-test items on the Progress Check correctly (achieve Lesson Topic Learning Objectives) and then proceed to the next Lesson Topic.

In previous units of instruction, a technical manual called a HANDBOOK OF SERVICE INSTRUCTIONS (HSI) was provided. The manual was divided into five parts with a separate ILLUSTRATED PARTS BREAKDOWN (IPB). In this unit you will be provided with a new manual called a MAINTENANCE INSTRUCTION MANUAL (MIM). This manual covers the same information as the HSI. However, the MIM, which contains five sections, is more readily adapted to each level of maintenance.

Publications issued by the Naval Air Systems Command are designated according to a numbering system based on the type publication and its material content. The system cannot be described fully in this course because of its complex nature and many exceptions.

The standard designation for technical manuals consists of a prefix and alphanumeric (letter-number) sequence of three or four parts. The example below is used to explain the designation system for technical



STANDARD DESIGNATION FOR MANUALS

The prefix may consist of the letters NAVAIR, NAVAER (often abbreviated NAVWEPS (normally abbreviated NW), AN, TO, or CO. NAVAER manuals were published by the Bureau of Aeronautics before the establishment of the Naval Air Systems Command. However, all manuals published since that time are designated with the NAVAIR prefix.

Part I of the coded designation shown above consists of numbers to indicate the general subject classification with the basic subject to which it pertains. These numbers usually have two digits; however, when an additional classification breakdown is necessary, Part I consists of two digits followed by a letter. An aircraft manual is assigned the digits 01 immediately following the prefix NAVAIR.

manufacturer of the aircraft or equipment. An example is NAVAIR 01-75PAA-2-6.1. 75 represents the specific manufacturer and PAA represents the aircraft model.

Part III consists of a number or numbers which designate a specific manual. Examples of these numbers are shown below.

NA 01-75PAA -1 --- FLIGHT MANUALS (NATOPS)
NA 01-75PAA -2 ---MAINTENANCE INSTRUCTION MANUALS (MIM)
NA 01-75PAA -3 ---STRUCTURAL REPAIR
NA 01-75PAA -4 ---ILLUSTRATED PARTS BREAKDOWN (IPB)

Part IV pertains only to certain specific classes of manuals (such as a MIM for an aircraft), and designates a particular manual of a set. For example; Part IV of the standard designator for an aircraft MIM indicates the subject content of the manual. This designator may consist of a number, a number and decimal, or even a number with double decimals, as required, to breakdown the information sufficiently. Due to the differences in operational usage of various models of aircraft, this system has not been standardized completely. However, the following partial listing is typical for aircraft:

- 2--Airframes Maintenance Instructions Manual.
- 0--Maintenance Planning Data (For some models of aircraft, this data is contained in a -100 publication rather than in -2-0.)
 - 1.1--General Information and Servicing.
 - 1.2--Corrosion Control and Decontamination.
- 2--Airframe Systems
 - 3--Powerplant and Related Systems.
 - 4--Instrument Systems.
 - 5--Electrical Systems.
 - 5.1--Electrical Power Supply System.
 - 5.2--Lighting System.
 - 6--Electronic Systems.
 - 7--Armament and Related Systems.
 - 8--Airborne Missile Control Systems.
 - 9--Systems Integration.
 - 10--Wiring Diagrams.
 - 10.1--Wiring Data Diagrams.
 - 10.2--Wiring Data Repair.

Each category may be broken down into single or double decimal subdivisions as the occasion requires.

the MIM contains information concerning location, function, operation, installation, testing, adjustments, and troubleshooting and for the installed system components.

One of a MIM contains a Table of Contents, a List of Illustrations, Tables and five (5) sections. The Table of Contents in the Instruction Manual, Navy Model 15A21, contains a listing of the sub-heading titles, paragraph and page numbers as an aid in locating narrative information about the radar system. The proper use of Contents will allow a technician to locate rapidly the information required to perform maintenance or operation of the correctly.

The List of Illustrations and the List of Tables are for rapid location of figure or table contained within the MIM. The List of Illustrations, of figure numbers, page, and title numbers for each figure. A figure number, title, and page number is contained in the List of Tables.

Use of the Table of Contents, List of Illustrations or List of Tables will aid in locating a description, an illustration or data in a table for a specific item.

Use of a description of a unit and the appropriate illustration of the Table of Contents and the List of Illustrations provide the figure number, _____ and _____ numbers.

page

The Table of Contents is a listing of the five major sections:

- I INTRODUCTION
- II DESCRIPTION AND OPERATION
- III ORGANIZATIONAL MAINTENANCE
- IV INTERMEDIATE MAINTENANCE
- V CHARTS AND DIAGRAMS

The "Introduction", contains all of the general information of the system in hand. This will typically include a general description of the system, the scope of coverage, arrangement of information, a listing of applicable technical directives and a list of applicable publications includes the manuals for the Test Equipment used on the system provided by the MIM. This section is frequently overlooked by technicians, importance should not be taken lightly since the information provided is essentially the "doorway" to what follows. With it, you will be able to maintain your system and, if necessary, find the publications to maintain your support equipment.

description of the aircraft, system, or equipment. This description contains component complement, listing equipment components; fuses, tubes, and transistors, electrical specifications; input and output minimum performance standards and the handling and installation instructions. Section II contains the theory of operation and the circuit functions of the various major units in the radar system explained through the aid of block diagrams and simplified schematic diagrams. The operating instructions describe the various controls and indicator functions; it also provides an explanation of the various symbols, terms, and basic circuits used in the radar system.

Section III, "Organizational Maintenance," of the MIM contains Equipment Required tables, Equipment Required but not Supplied, Daily and Preflight Inspections procedures, operational checks, Major Test Points tables, Removal/Replacement of major units, frequency alignments and the preventive maintenance required by the organizational level technician to maintain the radar system. The equipment supplied and equipment required but not supplied are listed in tables 3-1, 3-2, and these tables list the total complement of the system and the required test equipment or tools recommended to maintain the system properly.

The daily and preflight inspections tables 3-3a thru 3-4, consist of the inspections, initial control setting and operational checks, and aided operating instructions are used in performing system checks. The list of major test points with the normal indications and the Functional Checks table are aids to an organizational technician in troubleshooting a malfunction. Other areas in section IV include the major unit removal/replacement procedures and the alignments performed by the organizational technician.

Section IV, "Intermediate Maintenance", provides more in-depth information to the technician that performs component repair. Included in section IV are data on performing checks, tests, alignments, troubleshooting and disassembly/reassembly of the major units to facilitate repairs. As an aid to performing the tests, checks, alignments and troubleshooting, a list of the secondary and minor test points with normal indications is included. The troubleshooting tables describe the most common or the most difficult malfunctions that occur within the radar system.

Section V, "Charts and Diagrams", contains the complete set of wiring and schematic diagrams for the units covered by the manual. In addition to these diagrams, there are functional and expanded detailed block diagrams showing the relationship between equipment, major signal paths, major and secondary test points.

Contains system troubleshooting charts.

Contains wiring diagrams.

Contains theory of operation.

Contains a listing of applicable technical directives.

Contains a listing of performance tests and alignments.

Contains equipment and component complement.

Contains operational checks and test equipment connections.

(1) Section I, Introduction.

(2) Section II, Description and Operation.

(3) Section III, Organizational Maintenance.

(4) Section IV, Intermediate Maintenance.

(5) Section V, Charts and Diagrams.

, b. (5), c. (2), d. (1), e. (4), f. (2), g. (3)

At this point, you may take the Lesson Topic Progress Check. If you answer all self-test items correctly, go on to the next Lesson Topic. If not, return to the beginning of the Lesson Topic and use another medium of instruction for the Lesson Topic: Progress Check, Summary, or consultation with Learning Supervisor, until you answer all self-test items on the Progress Check correctly (achieve 100% on Lesson Topic Learning Objectives) and then proceed to the next Lesson Topic.

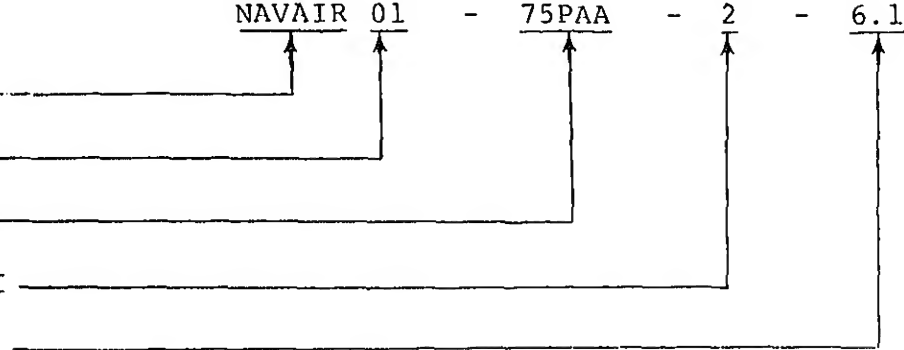
PURPOSE AND FORMAT OF MAINTENANCE INSTRUCTION MANUAL

INTRODUCTION

In previous units of instruction, a technical manual called a HANDBOOK of SERVICE INSTRUCTIONS (HSI) has been provided. The manual was divided into nine parts with a separate ILLUSTRATED PARTS BREAKDOWN (IPB). In this unit you will be provided with a new manual called a MAINTENANCE INSTRUCTION MANUAL (MIM). This manual covers the same information as the HSI; however, the MIM, which contains five sections, is readily adapted to each level of maintenance.

Publications issued by the Naval Air Systems Command are designated according to a numbering system based on the publication and its material content. The system cannot be described fully in this course because of its complexity and many exceptions.

The standard designation for technical manuals consists of a prefix and an alphanumeric sequence of three or four characters. The example shown on the following page will be used to explain the system for designation of technical manuals.



STANDARD DESIGNATION FOR MANUALS

Fix may consist of the letters NAVAIR, NAVAER (often
ated NA), NavWeps (normally abbreviated NW), AN,
CO. NAVAER manuals were published by the Bureau of
ics before the establishment of the Naval Air
Command. However, all manuals published since that
re designated with the NAVAIR prefix.

of the coded designation shown above consists of numbers to
y the general subject classification with the basic
to which they pertain. These numbers usually have
ts; however, when an additional classification break-
necessary, Part I consists of two digits followed by
r. An aircraft manual is assigned the digits 01
ely following the prefix NAVAIR.

Part II of the standard designator consists of numbers (numbers and letters) and indicates the specific class, type, or module and manufacturer of the aircraft or equipment. An example is NAVAIR 01-75PAA-2-6.1. 75 represents the specific manufacturer and PAA represents the aircraft model.

Part III consists of a number or numbers which designate a specific manual. Examples of these numbers are shown

NA 01-75PAA -1 ---FLIGHT MANUALS (NATOPS)
NA 01-75PAA -2 ---MAINTENANCE INSTRUCTION MANUALS (MIM)
NA 01-75PAA -3 ---STRUCTURAL REPAIR
NA 01-75PAA -4 ---ILLUSTRATED PARTS BREAKDOWN (IPB)

Part IV pertains only to certain specific classes of manuals (such as the MIM for an aircraft), and designates a particular manual of a set. For example, Part IV of the standard designator for an aircraft MIM indicates the subject content of the manual. This designator may consist of a single number, a number and decimal, or even a number and double decimals, as required, to breakdown the information sufficiently. Due to the differences in operational use of various models of aircraft, this system cannot be standardized completely. However, the following partial list is typical for aircraft:

-2--Airframe Maintenance Instructions Manual.

Maintenance Planning Data (For some models of aircraft, this data is contained in a -100 publication rather than in -2-0.)

-General Information and Servicing.

-Corrosion Control and Decontamination.

Airframe Systems.

Engine and Related Systems.

Instrument Systems.

Electrical Systems.

-Electrical Power Supply System.

-Lighting System.

Electronic Systems.

Armament and Related Systems.

Airborne Missile Control Systems.

Systems Integration.

Wiring Diagrams.

--Wiring Data Diagrams.

--Wiring Data Repair.

This category may be broken down into single or double

subdivisions as the occasion requires.

1. The purpose of a Maintenance Instruction Manual (MIM) is to provide information and instructions required to perform maintenance on an aircraft and systems in the aircraft. The aircraft, with all systems installed, is designated an aircraft weapons system. The MIM contains information concerning location, function, operation, removal, installation, testing, adjustments, and troubleshooting. The maintenance methods recommended are those that can be performed by an operating squadron.

The purpose of the MIM is to provide the _____ and _____ required to perform maintenance on an aircraft.

- on 2. The purpose of a maintenance instruction manual is to
- a. provide information and illustrations on part number listings and pictorial views of aircraft components.
 - b. provide instructions and information for the pilot and air crew concerning aircraft operating procedures.
 - c. provide information and instructions required to perform maintenance on an aircraft and systems installed in the aircraft.
 - d. provide technical information on documentation procedures utilized in aircraft maintenance.

3. A typical volume of the MIM contains a table of contents, a list of illustrations, a list of tables, and five (5) sections. (Refer to the training Maintenance Instruction Manual throughout this program.)

The table of contents is used to locate the narrative information provided in the MIM. The left column identifies the section number using Roman numerals and the section title is located just to the right of the section number.

The narrative in each section is constructed of paragraphs. The major paragraph is identified in the table of contents by paragraph number and title.

The List of Illustrations consists of a list of the figure numbers, the title and page number of each figure. The List of Tables includes the table number, title, and page number of each table. Table of Contents, the List of Illustrations and the List of Tables, pages are numbered in lower case Roman numerals in sequence (i, ii, iii, iv, etc.)

To locate a description of a unit and the appropriate illustration of a unit, the Table of Contents and the List of Illustrations provides the paragraph, _____ and _____ numbers.

4. Select three parts of a MIM used to locate specific paragraphs, diagrams, and tables.
- a. List of part numbers.
 - b. Table of Contents.
 - c. List of Tables.
 - d. List of Illustrations.

5. The MIM provides _____ and _____ required to perform maintenance on an aircraft and systems in the aircraft.

- tion
tions
6. Included in the Table of Contents is a listing of the five major sections:
- Section I - INTRODUCTION.
- Section II - DESCRIPTION AND OPERATION.
- Section III - ORGANIZATIONAL MAINTENANCE.
- Section IV - INTERMEDIATE MAINTENANCE.
- Section V - CHARTS AND DIAGRAMS.
- The format of your training MIM is similar to MIMs found in operating activities.

Section I, "Introduction," contains a the general information that is included in the publication: a general description of the manual, including the scope of coverage and the organization and arrangement of the information, a listing of applicable publications, and a list of technical directives that pertain to specified equipment covered by the manual.

The _____ section contains a general description of the manual, a list of applicable technical directives, and all applicable publications.

7. What information is contained in the

introduction section of the MIM?

- a. A general description of the manual, a list of electrical specifications, and all applicable publications.
- b. A list of equipment supplied, handling and installation information and operating instructions.
- c. A general description of the manual, a list of technical directives, and all applicable publications.
- d. A general description of the manual, a list of technical directives, and a troubleshooting chart.

8. In a MIM, a list of descriptive paragraphs

is found in the _____ of _____,

a listing of the figure numbers within the

MIM is found in the _____ of

_____, and a listing of tables is

found in the _____ of _____

9. The purpose of the MM is to:

- a. provide information and instruction aircraft support equipment repairs.
- b. provide technical information on documentation procedures utilized in aircraft maintenance.
- c. provide information and instruction the pilot and air crew concerning aircraft operating procedures.
- d. provide information and instruction required to perform maintenance on aircraft.

d.

10. SECTION II, the "Description and Operation" provides a physical description of the aircraft equipment with handling and installation instructions. Tables are provided listing the equipment's component complement, such as fuses, tubes, and transistors.

A table of electrical specifications provides the input and output minimum performance requirements. The operating instructions explain the functions of the controls and indicators. The theory of operation explains the circuit functions with the aid of illustrations, simplified schematic diagrams and block diagrams.

In some maintenance instruction manuals, a definition and explanation of terms is provided for quick reference.

Section II, "_____ and _____," contains a physical description, component complements, handling, installation, electrical specifications, operating instructions, and theory of operation which includes block diagram and circuit analysis.

tion
on

11. What information is contained in Section II of the MIM?
- a. Electrical specifications.
 - b. Parts list.
 - c. Component complement.
 - d. Handling and installation.
 - e. Daily inspections.
 - f. Operating instructions.
 - g. Performance test instruction.
 - h. Description of aircraft or equipment.
 - i. Theory of operation.

12. A general description of the manual, a list of technical directives, and all applicable publications are contained in the _____.

roduc-

13. Which of the following can be used to locate specific paragraphs, figures, and illustrations in a MIM?
- a. Glossary of Terms.
 - b. Table of Contents.
 - c. List of Illustrations.
 - d. List of Tables.

14. Section III, "Organizational Maintenance," contains the necessary information that is used by technicians that perform organizational maintenance on the aircraft or systems installed in the aircraft.

The "Equipment Supplied" table lists the total complement of the system. An example of an equipment supplied table is table 3- in the MIM.

The "Equipment Required But Not Supplied Table," provides a listing of test equipment and tools that are necessary

to perform organizational maintenance on the radar system.

Daily and preflight inspection procedures are also provided in section III. These inspection procedures utilize the visual inspection, initial control settings and the operational checks tables.

A technician who is unfamiliar with the controls and indications can use the Operating Instructions in section II in performing the operational check provided in table 3-5 of the MIM.

Major test points are listed in table 3-7 with the normal indications provided in table 3-8.

The "Functions Checks" table is a troubleshooting aid which can be used to aid an organizational technician in locating the cause of listed malfunctions.

Other areas covered in section III include major unit removal, replacement, frequent alignments, and preventive maintenance.

Section III of a MIM contains Equipme
_____ tables, Equipment _____
but not _____ tables, Daily and _____
inspection procedures, _____
checks, and _____ test point
tables, Removal and/ _____
of major _____ and _____
alignment.

Supplied
Required
Supplied
Preflight
Operational
Major
Reinstalla-
tion
units
frequency

15. Which of the following information is contained in section III of the MIM.
- a. Functional Checks and major unit removal/replacement.
 - b. Component part location.
 - c. Daily and Preflight inspection.
 - d. Theory of operation.
 - e. Frequency alignments and Operatic Checks procedures.

16. Section 11, Description and operation, contains a physical description of the aircraft/system, listings of components, electrical characteristics, performance requirements, and operating instructions, also a discussion of the theory of operation, various terms, and the simplified schematics and block diagrams.

TRUE/FALSE. (Circle one).

17. The Introduction Section of a MIM contains

- a. a general description of the manual, a list of technical directives, and a troubleshooting chart.
- b. a general description of the manual, a list of electrical specifications, and all applicable publications.
- c. a list of equipment supplied, handling and installation information, and operating instructions.
- d. a general description of the manual, a list of technical directives, and all applicable publications.

Section IV, Intermediate Maintenance, provides the necessary data for performing checks, tests, alignments, and disassembly/reassembly of the major units that make up a system.

Secondary and minor test point tables are included as a guide for performing minimum performance tests, troubleshooting, or alignment.

Section IV of the MIM includes

_____ and _____

test point tables to be used for minimum performance tests,

_____ or

_____.

or
uble-
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gnment

performance testing, alignment procedures, and secondary and minor test points are included in section:

- a. II.
- b. IV.
- c. III.
- d. V.

20. Which two items below are not found in section III of the MIM?

- a. Removal and replacement procedures.
- b. Operational checks.
- c. Daily and Preflight Inspections.
- d. Equipment supplied lists.
- e. Equipment required but not supplied.
- f. Functional checks.
- g. Theory of operation.
- h. Tube and transistor complements.

h.

21. Which of the following is information contained in the Description and Operation Section of the MIM?

- a. Daily inspection and performance test procedure.
- b. Component complement and electrical specifications.
- c. Handling and installation and description of major assemblies.
- d. Operating instructions and theory of operation.

b,
c,
d.

22. Section V, "Charts and Diagrams," contains a complete set of wiring and schematic diagrams for the units covered in the manual. Included is a functional block diagram that presents an overall functional view of the relationships between circuit blocks and the major signal paths to and from the blocks.

Wiring diagrams, schematic diagrams, and functional block diagrams are found in section _____.

23. Which three items are included in section V of the MIM?
- Simplified block diagrams.
 - Functional block diagrams.
 - Component part locations.
 - System wiring diagrams.
 - Schematic diagrams.
-

24. The Intermediate Maintenance Section of a MIM contains disassembly/_____ procedures, _____ and _____ test point tables, _____ and alignment procedures.

25. Which of the following describes information not contained in the Organizational Maintenance Section of a MIM?
- Equipment supplied and major unit removal/replacement.
 - Operational checks.
 - Theory of operation.
 - Daily inspection and Preflight inspection.

- c. 26. List the three items found in the Charts and Diagrams section of the MIM.
- a. _____.
- b. _____.
- c. _____.

- a. Functional block diagram.
- b. Schematic diagrams.
- c. System wiring diagrams.
27. The Intermediate Maintenance Section of the MIM contains
- a. circuit board repair instructions and electrical specifications.
- b. secondary and minor test point test procedures for performance tests, alignment and disassembly/reassembly of the major units.
- c. operating instructions and daily inspection procedure.
- d. performance test procedure and a diagram analysis.

- b. 28. Select the items which are contained in the Charts and Diagrams Section of a MIM.
- a. Simplified block diagram.
- b. Overall functional block diagram.
- c. Complete schematic diagrams.
- d. System wiring diagrams.

At this point, you may take the lesson topic progress check. You may find it beneficial to review the objectives for this lesson topic. If you answer all self-test items correctly, go on to the next lesson topic. If not, select and use another medium of instruction, narrative, or consultation with the learning supervisor, until you can answer all self-test items on the progress check correctly (achieve lesson topic learning objectives) and then proceed to the next lesson topic.

AVIONICS TECHNICIAN COURSE, CLASS A1

UNIT 5

MODULE 1

LESSON TOPIC 2

TING INFORMATION FROM MAINTENANCE INSTRUCTION MANUALS

OBTAINING INFORMATION FROM MAINTENANCE INSTRUCTION MANUALS

In this lesson topic you will extract information from each of the MIM. The purpose of this lesson topic is to provide guidance for the proper use of the MIM in obtaining necessary information to meet organizational and inter-maintenance requirements comparable to those maintenance elements performed by avionics technicians in operating procedures.

Learning objectives for this lesson topic are as follows:

1. Given the MIM of the 15A21 radar trainer, and an illustration of the radar trainer, label each major unit.

2. Given the Electrical Specifications Table in the 15A21 radar trainer MIM and an incomplete table, list the LIMIT or Description for each listed Characteristic.

3. Given a table, fill in each blank with the appropriate data obtained from the Interconnections and Test Cable Connections table located in the radar trainer MIM.

4. Given a list, select from a list the necessary control settings required to obtain given functions/indications.

5. Given the MIM of the 15A21 radar trainer, list the two major subdivisions of the Preflight Inspection table.

6. Given a list of checks, select the checks that make up the Functional Checks Table for the airborne search radar trainer.

7. Given the discrepancy that the antenna will not rotate with Mode selected; select the major test point(s) that are listed on the Functional Checks Table for this discrepancy.

8. Given a list of major test point symbols, list the reference designator and signal nomenclature for each symbol.

9. Given a list of major test points, list the required signal stage characteristics for each test point.

waveform for each test point.

11. Given a list of minor test points and a MIM for the trainer, list the location reference designator and clature of each minor test point.
12. Given a list of signal nomenclatures, list the requi signal characteristic as specified in the Performanc Tests and Alignment procedures in the MIM.
13. Given the Unit Troubleshooting Tables in the MIM and specific trouble, list the Probable cause and Correc Action as specified in the MIM.
14. Given the Functional Block Diagram in the MIM for th radar trainer, complete a statement that describes t signal/voltage for each specified test point.
15. Given the Power Distribution Diagram in the MIM for radar trainer, and a specific voltage to or from a s cific major unit, select the applicable cable refere designator.
16. Select from a list, the part number and description specified components as they are listed in the Group Assembly Parts List Section of the IPB for the radar trainer.
17. Given a part number, select from a list the componen cription and location using the IPB for the radar tr
18. Given a reference designator and the IPB for the rad trainer, select from a list the correct part number component description.

NOTE: All objectives in this lesson topic must be accomp with 100 percent accuracy, unless otherwise stated

Prior to beginning this lesson topic, carefully review th of Study Resources". Keep in mind that your learning sup can be your most valuable learning resource. Always feel to consult with him if you have problems or questions.

ING INFORMATION FROM MAINTENANCE INSTRUCTION MANUALS

the material in this lesson topic, you may choose, to your experience and preferences, any or all of the written lesson topic presentations.

ESSON TOPIC PRESENTATIONS IN MODULE BOOKLET:

- n topic summary.
- ammed instruction form of lesson topic.
- tive form of lesson topic.
- n topic progress check.

L MATERIALS REQUIRED FOR SUCCESSFUL COMPLETION OF PIC:

enance Instruction Manual, Airborne Search Radar
er 15A21, Illustrated Parts Breakdown, Airborne Search
Trainer, 15A21.

- nt Response Sheets.
- ob data sheets.
- nswer sheet for use with test.
- rogrammed instruction response sheets.

T MATERIALS (topic reference):

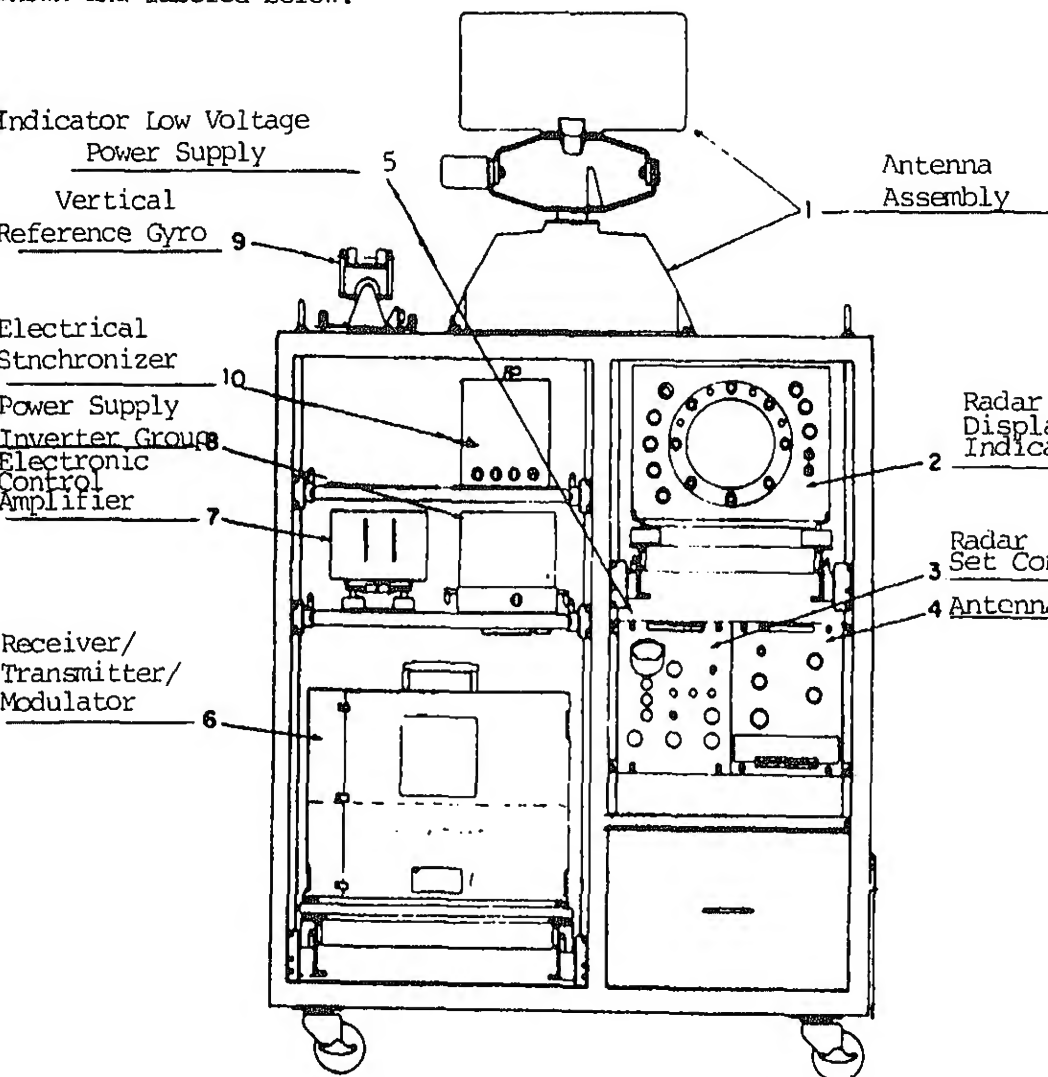
Electronics Technician 3 & 2, NAVPERS 10317-D, CH. 4.

resources listed above are available and may be used as
it. Your learning supervisor represents a most valuable
resource. Use him when you need help. It is not
to use all the resources to achieve the learning objec-
the lesson topic. The lesson topic progress check is
s of determining when you have achieved the objectives.
ess check may be taken at any time and is graded by
you fail to achieve any objective at the lesson topic
u will plan and accomplish your own remediation. If
help in remediation planning, consult your learning
r.

LESSON TOPIC SUMMARY

EXTRACTING INFORMATION FROM MAINTENANCE INSTRUCTION MANUALS

The 15A21 radar trainer consists of 10 major units. These units are shown and labeled below.



The Electrical Specifications, table 2-4 in the MIM, consists of the characteristic and the Limit or Description columns. A description of limitation is specified for each characteristic. To insure that all cables between the major units are connected properly, the technician should refer to the Interconnection and Test Cables Table 2-5. This table gives the cable part number and lists the reference designator for each connector to which the cable is attached. Figure 2- depicts the physical routing of the interconnection cables

the Antenna Control, Display-Indicator, Radar Set Control, and the Simulated Vertical Reference Gyro respectively. The function of the controls are described in table 2-6.

Inspections are performed on all systems installed in an aircraft to ensure security and operational readiness. Table 3-3a provides a procedure for performing a visual inspection of the search radar trainer. The Control Setting (Table 3-3b) lists the individual control settings established prior to turn-on of the radar. Table 3-5, the Operational Readiness Table, is designed to aid the technician in determining the operational readiness of the radar. It consists of three columns: The first column describes the individual checks to be performed; The second column provides a reference to paragraphs, tables or figures that the technician should refer to in performing each specific check; The Corrective Action column specifies the corrective action or reference to the Functional Checks

Table 3-7 is a guide designed to aid the technician in diagnosing malfunctions in the airborne search radar trainer. The table lists common faults. The Probable cause column lists the probable cause of each problem. The applicable major test point(s) and is provided for each fault. The Corrective Action column lists the repair or replacement that will correct each specific malfunction.

The MIM provides a listing of the major test points. The first column lists each major test point in numerical sequence. A location designator for each major test point is given in the Location column. The signal/voltage for each major test point is listed in the Signal/Voltage column.

Major test points are used to isolate malfunctions to a major assembly. Table 3-8, Functional Check-Major Test Point Waveforms, provides information concerning major test points. This table has three columns: Major Test Points, Location Reference Designator, and Waveform/Indication. The Secondary Test Points and Indications Table 4-1, lists the secondary test point number and reference designator. The right column lists the nomenclature of the signal and specifies or illustrates the normal indication for each test point.

Minor Test Points, lists the reference designator, signal/voltage, nomenclature and normal indication for each minor test point.

The Maintenance Test and Alignments procedures provided in section IV of this manual specifies the minimum checks and tests that are necessary to maintain the performance of the radar, as well as procedures for aligning the

The trouble shooting table, 4-4 through 4-13 consists of three columns, the probable cause and corrective action.

the major units and gives the nomenclature of the signals. The Power Distribution Diagram, figure 5-2 in the MIM, lists the cable reference designators, the pin connectors for the cables, and the signal/voltage or other applicable information for each cable.

The IPB is divided into four sections. Section I contains information on how to use the IPB. Section II, the Group Assembly Parts List, contains illustrations of the individual units and cards/subassemblies showing component location with an index number for each component. Following each figure is a five-column table listing the following:

1. Figure and index numbers,
2. Part number,
3. Description,
4. Units per assembly, and
5. Usable on code (Not used in the IPB for the search radar trainer)

The Numerical Index, in section III of the IPB, lists part numbers and cross references the part numbers to Figure and Index numbers. The Reference Designation Index, section IV in the IPB, provides a listing of the reference designators in alphanumerical sequence with the applicable part number and figure and index number listed for each reference designator.

At this point, you may take the Lesson Topic Progress Check. If you answer all self-test items correctly, go on to the next Lesson Topic. If not, select and use another medium of instruction for the Lesson Topic. This may be Programmed Instruction, Narrative, or consultation with the Learning Supervisor, until you can answer all self-test items on the Progress Check correctly (achieve Lesson Topic Learning Objectives) and then proceed to the next Lesson Topic.

Technicians that perform maintenance on avionics systems at the final or intermediate level must be proficient in the extraction of information from the MIM of the aircraft/system. He must know the Table of Contents, the List of Illustrations and the List of Figures located in the front of the MIM to determine the page/paragraph necessary to locate specific information.

The first steps in performing maintenance on systems installed in an aircraft are the locating of the major units/assemblies. The MIM provides a list of the aircraft by systems. Technicians use the part of a diagram that describes and illustrates the locations of installed system components.

Section III of the MIM provides figures and tables that can be used to determine the location, nomenclature and reference designators for the units that make up the Airborne Search Radar Trainer. Figures 2-1 through 2-13 in the MIM depict the front and rear views of the radar trainer. Figure 2-3 depicts the routing of the interconnecting cables. Figures 2-4 through 2-13 depict the ten major units individually. A description of a major assembly (unit) is provided in paragraphs 2-19 through 2-24 of the MIM. Figure 2-3A shows the location of Major Units.

Technicians should become thoroughly familiar with the capabilities and limitations of the system prior to performing any operational checks or tests. The electrical specification table (table 2-4) is provided in the MIM. It gives a description/limitation of the operating characteristics of the system. Table 2-6 & Figure 2-15 describes the control settings.

The operating characteristics are listed under the following headings: General, Transmitter, Receiver, Indicator/Synchronizer, and Antenna.

Refer to the Electrical Specifications Table in the MIM. List the PX and TX peak power. _____ and _____

300-1000 Watts

Another important factor is that a technician must know the proper interconnecting of the cables between the major units/assemblies. Illustrations and tables are provided that describe the routing and proper connection of the cables. Table 2-3 depicts the routing of the cables between the major units of the radar trainer. Each jack is identified by a reference designator. Table 2-5 in the MIM lists the reference designators (W2, W3 etc.) for each interconnecting cable. A part number for

able W7 is connected between _____ and _____;
able # _____ is connected between jacks A8J1 and PS1J4.

J1; A4J1; W19

There are numerous types and models of avionics systems that a technician must operate during operational checks, or while making specific checks to isolate a cause of a malfunction. Prior to operating any avionics system, the technician must at least have a basic knowledge of how the system is controlled. To achieve the basic knowledge of the functions performed by the operating controls and indicators, a technician should refer to the operating instructions, paragraphs 2-54 through 2-57 in the MIM. Figures 2-1 through 2-13 depict the major units that have operating controls.

The name (nomenclature) and the reference designator is given for each control and indicator.

Table 2-6 may be used with figures 2-14 through 2-18 to associate each control or indicator with its purpose or functional indication. Table 2-6 is arranged in the following sequence: Antenna control unit, Display Control, Radar Set Control, Synchronizer and the Simulated Vertical Reference Gyro Unit.

Refer to table 2-6 and figure 2-16 in the MIM. Which light will be illuminated when the OFF-STBY-ON switch is in the ON position? _____

Light

Section III of a MIM consists of information that is used primarily by technicians in aircraft squadrons. One of the most common jobs performed by technicians in a squadron is performing a preflight check on the avionics systems installed in each aircraft. The procedures for performing preflight checks are normally specified for each system. Paragraphs 3-8 through 3-11 in the MIM for the airborne search radar trainer describe the steps in performing a preflight inspection including the visual checks, initial control setting, and the operational checks.

which is sub-divided into two parts. The visual inspection will verify the material condition of the systems installation. Control setting (table 3-3b) should be performed prior to the of the operational check. This is very important because if controls are improperly set, damage to the equipment or injury working in or around the aircraft or equipment could occur.

s 3-3a and 3-3b. List the titles for each below.

1 Inspection Procedures
al Control Settings.

Visual inspection and initial control settings have been performed, major part of the preflight is to perform the operational check paragraphs 3-26 through 3-29 in the MIM. The operational check is also performed during other inspections to verify malfunctions ensure the system functions properly after repair has been performed system. Table 3-5 consists of three columns titled Procedure, and Corrective Action. It follows a step-by-step check of all system.

Major steps that are listed in the operational checks table.
checks.
mode checks.
checks.
t checks.
e checks.
cks.
checks.
y checks.
Stabilization checks.
ter checks.
ecks.

g, h, i, j

Purpose of an operational check is to determine the operational a system, any operational malfunction should be checked out the cause of the malfunction.

e and Corrective Action columns of the operational check (table es the appropriate step to use in the functional checks table

function, the technician will perform further checks at designated test points.

Most faults listed in table 3-7 have one or more possible causes listed in the probable cause column. No attempt has been made to list all possible causes. One or more major test points are listed for each probable cause. A technician should check as many test points as needed to locate the defective major unit.

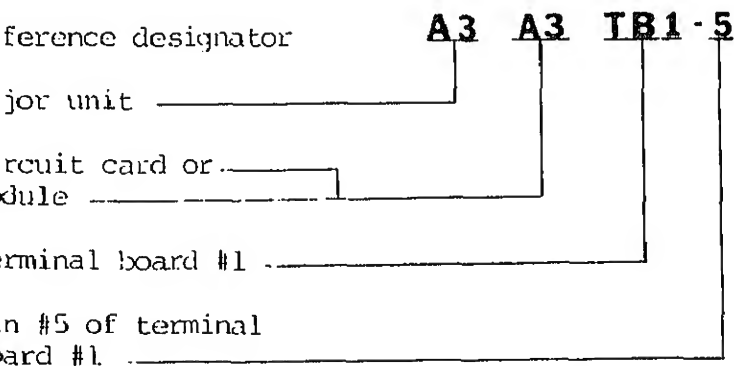
Refer to step 2 of the Functional Checks, Table 3-7, and list the major test points that should be checked for a probable cause of : No sweep signal.

110, 111, 112, 18, 20

Major test points are listed in table 3-6. The left column lists the test points in numerical sequence. A reference designator is listed in the "Location" column for each major test point which is used with the appropriate figure (figure 3-4 through 3-13) to determine the physical location of each test point. Major test points are used to isolate malfunctions to a major unit.

The complexity of a reference designator is determined by its physical location. A reference designator for a test point located on a circuit board could have more designators than a reference designator for a test point located externally on a major unit.

The following is a breakdown of an example reference designator to show what each part represents,



Some test points are located externally of the major unit and use test jacks. These test jacks are identified in a similar manner.

signator

A6 A1 A1 T B1-1

or
b-assembly

rd #1

terminal board #1

g designators are commonly used in reference designators.

t point

terminal board

cuit card or subunit plug/jack connector

tage test point

k

tch


ion column of table 3-6 describes the normal signal, voltage, or
r each major test point. List the location and description of
oints 63 and 116.

63 _____


116 _____

Mag current input

-3, 2-20 mile range control input to synchronizer.

Major test point waveforms (table 3-8). This table provides the test points in numerical order, the reference designator location, the voltage/waveform normally observed for each test point used in functional check. Refer to major test point  on table 3-8. Major test point 6 is shown having three (3) distinct waveforms. This is because of the different ranges selectable on the display-indicator. Each waveform shown provides the cycle time, pulse train length, pulse spacing, maximum amplitude and the reference level.

tain the specific information for the following major test points.

 Maximum amplitude of noise is _____

 Indication is _____

- +.2v

#7 - +12 vdc

performance of intermediate maintenance is more involved than organizational maintenance. Section IV of the MIM provides the necessary information to maintain the radar system at this higher level of maintenance. Technician performing organizational maintenance only had to find the defective "black box" or major unit. Then the intermediate maintenance technician must be able to troubleshoot each malfunction to the defective module, stage, circuit, and component. Contained in section IV are test point tables, troubleshooting tables, adjustments and alignments, and assembly/disassembly procedures. The tables of test points include secondary (table 4-1) and minor (table 4-2) test points. Secondary test points (table 4-1) are used to isolate the cause of malfunctions to defective modules/circuit cards or networks that are a part of a major unit/assembly. Minor test points (refer to table 4-2) are used to isolate malfunctions within the modules or circuit cards. You will notice that the test point tables are designed along the same order and by mastering the use of one, the other is easy.

at the reference designator and nomenclature for secondary test point

2MGL-8

AZ TACH SIGNAL

), (B), or (AA), where the minor test points use capital letters
 Arabic numerals enclosed in circles, as shown in the following

(A1)	(A2)	(A3)	etc.
(B1)	(B2)	(B3)	etc.

In table 4-2, the minor test points are sequenced consecutively
 by major units. Simple examples of uses of minor test points
 are voltage and resistance test points, output of a stage/circuit
 element of gain, signal injection and isolation checking for defects.

In the Minor Test Point Table, list the required information below.

	Ref. Design.	Indication
	_____	_____
	_____	_____
1-5	Resolver Sweep	
B1-2	Azimuth Drive Signal	

Performance of the avionics radar system is very difficult. So to
 overcome this difficulty, a step-by-step procedure outlining troubleshooting,
 the test, and alignments of the various major units is provided in
 section IV. Refer to the Performance Tests and Alignments portion of
 section IV. The procedures specified contain the minimum performance checks
 necessary to maintain the radar at its peak performance. These
 are combined for each major unit as an aid in verifying defects,
 and circuit alignment.

If troubles in an avionics radar system cannot be corrected by the
 operator or adjustments because of component failure, the defect must
 be reported and repaired or replaced as required. As an aid, section IV
 provides the intermediate maintenance technician with a series of tables,
 numbered 4-1 through 4-13, for each major unit that outlines the faults
 and test points necessary to isolate a defective circuit card or stage.
 For example, in the synchronizer unit, A3, the range mark output at A3A3TB1-5 is
 4.48 microseconds. Is this a normal or abnormal indication? If at A3A3TB1-1
 4.48 microseconds, is this normal or abnormal?

ABNORMAL

the range marks oscillators. However, some defects cannot be corrected by alignments or adjustments because of component failure. Section I of the MIM provides a separate troubleshooting table for each major unit listing the test points necessary to isolate malfunctions to an applicable circuit, card or stage.

Refer to table 4-5, trouble I, in the MIM. These six (6) steps following sequence will isolate a defective unit, card and component that will cause the fault "NO Intensity Control of the Display." On this same page, the other isolation steps will only isolate to a defective circuit card. This is done when the intermediate maintenance activity includes a module or section that performs only component repair on circuit cards.

List the corrective action for the trouble specified below.

Synchronizer

Trouble

Probable Cause

Corrective Action

Loss of 1 kHz

step 2a

output

Replace the A3A1 card.

The Charts and Diagrams, section V of the MIM, contains the functional diagrams, wiring diagrams and schematic diagrams for the radar system. The functional diagram, figure 5-1 sheet 1 of 9, shows the major signal flow paths between each of the major units and the major test points to isolate to a defective major unit/assembly. Following the functional block diagram (figure 5-1, sheets 2 through 9) are expanded diagrams of the detailed block diagram by major units/assemblies that also depict the signal paths and test points, but also have the secondary signal paths and their test points added.

Refer to the Functional Block Diagram (figure 5-1, sheet 1 of 9). List the output nomenclature and test points of the Simulated Vertical Reference Gyro Unit, A2.

Pitch reference

Roll reference

92

#93

Figure 5-2 shows the interconnecting power distribution schematic, input/output power paths can be found by jack, plug, and wire identification. This provides an easy aid in the location or no input voltage caused by a defective wire or unit. Figure 5-3, divided into three (3) sheets, shows all the interconnecting wiring (voltage, current paths) between units/subassemblies of the radar system. Figure 5-2, is used to locate defective plugs, jacks or wires.

Review of the interconnecting wiring diagrams, the plug, jack, and wire are identified by a standard code; "W" for wires or wire numbers, "J" for equipment jacks, and "P" for plugs. The wires within the diagrams are connected to either male or female pins and are identified by letter case letters.

Figure 5-3 in the MIM and list the wire numbers, plug and pin numbers and the listed signals/voltages between units.

Signal/voltage	Wire #	Plug #	Pin #
Waveguide Switch Control	_____	_____	_____
Tilt Angle	_____	_____	_____
<hr/>			
1/P2	S		
1/P2	L, M, N		

If a defective major unit, module/circuit card or component part has been identified, it must either be repaired or replaced. To facilitate this, the Illustrated Parts Breakdown (IPB) is provided for the aircraft or system. The IPB consists of four sections. Section I is the Introduction. Section II is the Group Assembly Parts List. Section III is the Alphabetical Index and Section IV is the Reference Designator Index. The Introduction contains information on scope, supplementary information, and how to use the IPB. Section II Group Assembly Parts Lists, contains figures and tables showing the physical location of components or units or circuit boards. As an example; suppose the antenna reflector is damaged and needs to be replaced. To do this, the part number and location are needed to be able to order the reflector from the supply. To locate this information, first refer to the table of contents and determine the figure and page number for the major unit, antenna assembly in which the component is located. The table of contents shows the antenna assembly in figure 1, sheets 1 and 2, on pages 2-1, 2-2. Referring to figure 1, sheet 1 of 2, the antenna reflector is identified by INDEX number 2.

and units per assembly. Refer to pg. 2-3 in the IPB and locate 1-2 figure/index number column. The part number, listed across from it, 803-1 and the description is Reflector, Antenna, A1 (529260C90041), units per assembly is 1.

transistor Q2 on the AFC INTEGRATOR CARD is defective. List the information for Q2 in each blank below. Refer to the IPB.

- . Figure and item number _____
- . Part number _____
- . Description _____
- . Units per assy. _____

- . 24-8 c. Transistor, PNP, silicon
- . 2N4931 d. one

The IPB also provides for situations where only a part number is known and the remainder of the information must be found. Section II of the IPB, the Numerical Index, provides a cross-reference from the part number, manufacturer's code, figure and index number, National Stock Number, (any), Quantity per trainer and course code. The part numbers are listed alphanumerically starting with letters and then numbers. The same part number may be used more than once in the equipment. If this occurs, figure/index numbers will be listed. You may use either index number to find the figure/index number, locate the part number, then turn to the corresponding figure/index number in section II. For example: refer to section III and locate part number RCR07G201JS, notice that the figure/index number is 5-29/18-11; now refer to section II and list the description below.

RESISTOR, FIXED COMPOSITION: 200 $\pm 5\%$, 1/4 WATT

Section IV, Reference Designator Index, is used when the reference designator is known. This section of the IPB is arranged alphanumerically listing in sequence all designators of the radar system. For example, during troubleshooting of the sweep generator card, C4 is found to be defective. The complete reference designator for C4 is A3A2C4 because it is located within the synchronizer unit, A3, and on the sweep generator card, A2. Refer to the IPB section IV, locate A3A2C4 and you find the part number CQ09ALMA333J3 and the figure/index number is 6-9. From this information, the location and description can be located in section I.

defective and must be replaced. List the required information

number _____
description _____
page/index number _____

OC60030

Bit card assembly; Resolver driver

point, you may take the Lesson Topic Progress Check. If you
all self-test items correctly, go on to the next Lesson Topic.
Select and use another medium of instruction for the Lesson Topic:
and Instruction, Summary, or consultation with Learning Supervisor,
can answer all self-test items on the Progress Check correctly
(Lesson Topic Learning Objectives) and then proceed to the next
topic.

PROGRAMMED INSTRUCTION

EXTRACTING INFORMATION FROM
MAINTENANCE INSTRUCTION MANUALS

INTRODUCTION

Technicians who perform maintenance on avionics systems at the organizational or intermediate level must be proficient in the extraction of applicable information from the maintenance instruction manual of the aircraft in which the avionics system is installed.

This lesson topic provides a breakdown of each section of the MIM for the Airborne Search Radar Trainer, Device 15A21.

Use the Table of Contents, the List of Illustrations and the List of Tables located in the front of the MIM to determine the page/paragraph number as necessary to locate specific information.

1. One of the steps in performing maintenance on a system installed in an aircraft is locating the major units/assemblies or components.

The Maintenance Instruction Manual of an airborne weapons system provides a break

1. (Continued)

down of the aircraft by systems. Avionics technicians use the part of a MIM describing and illustrating the location of avionics systems components.

The training MIM for the Airborne Search Radar Trainer, Device 15A21, provides a breakdown of the radar trainer in a similar manner as a MIM for an aircraft.

Section II of the MIM provides figures, tables and charts that can be used to determine the location, nomenclature and reference designator of the major units that make up the Airborne Search Radar Trainer.

Refer to section II of the MIM; how many major units make up the radar trainer?

2. Refer to section II of the MIM for the radar trainer.

2. (Continued)

List the nomenclature for each of the units, 1-5, as indicated in the illustration on the following page.

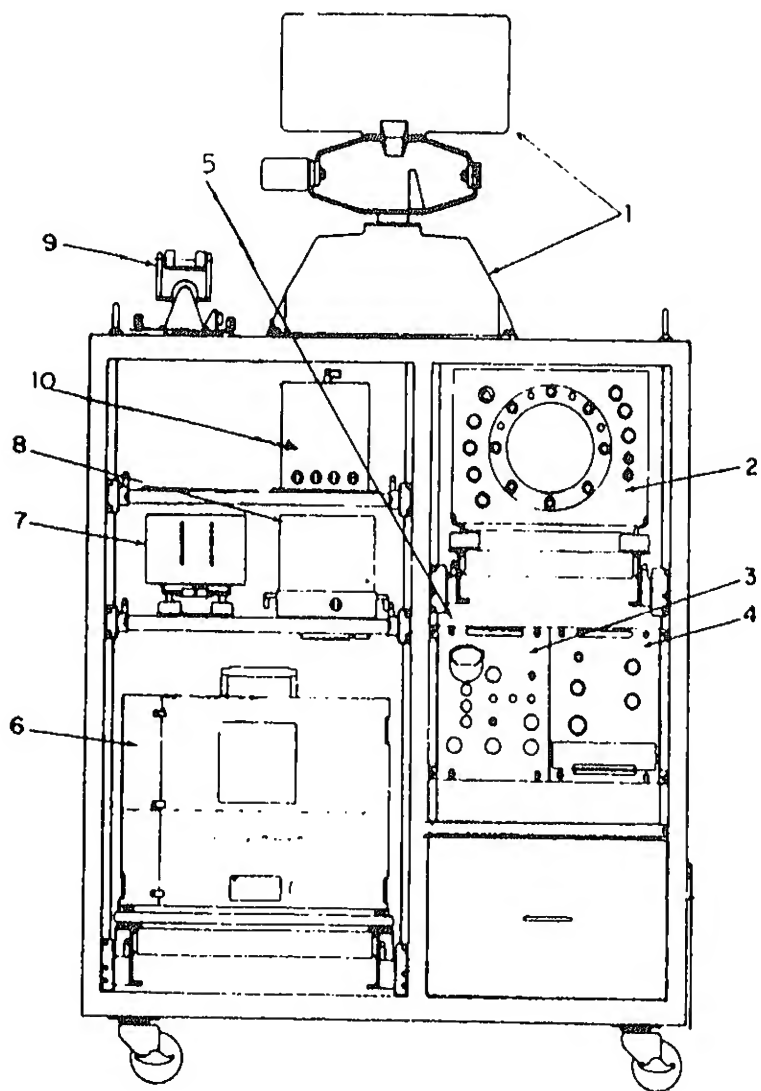
1. _____

2. _____

3. _____

4. _____

5. _____



Assembly (A1).	liar with the capabilities and limitation
Radar Display- Indicator (A4).	of an avionics system prior to performing any operational checks or tests.
Radar Set Control (A7).	Electrical specification tables are provi in maintenance instruction manuals for th
Antenna Control (A8).	purpose of providing data which specifies operating requirements and characteristic
Indicator Low vol- tage power supply (PS2).	Refer to the Electrical Specifications Ta in the MIM for the radar trainer. List t RX sensitivity and TX peak power. _____ and _____.

00 dbm 00-1000 watts	4. Refer to the Electrical Specifications Table in the MIM for the radar trainer and list the limit or description for each characteristic listed below.										
	<table> <tr> <th>Characteristic</th><th>Limit or Description</th></tr> <tr> <td>a. Input power.</td><td>_____</td></tr> <tr> <td>b. Dummy load.</td><td>_____</td></tr> <tr> <td>c. Pulse repetition frequency.</td><td>_____</td></tr> <tr> <td>d. Gain control</td><td>_____</td></tr> </table>	Characteristic	Limit or Description	a. Input power.	_____	b. Dummy load.	_____	c. Pulse repetition frequency.	_____	d. Gain control	_____
Characteristic	Limit or Description										
a. Input power.	_____										
b. Dummy load.	_____										
c. Pulse repetition frequency.	_____										
d. Gain control	_____										

e, 5. The description and operation section of a
rec- MIM provides figures that depict the major
e, units that make up the system.
c

-
ype, Refer to section II of the MIM. List the
ak nomenclature for each of the major units,
6-10, as indicated in the illustration on the
following page.

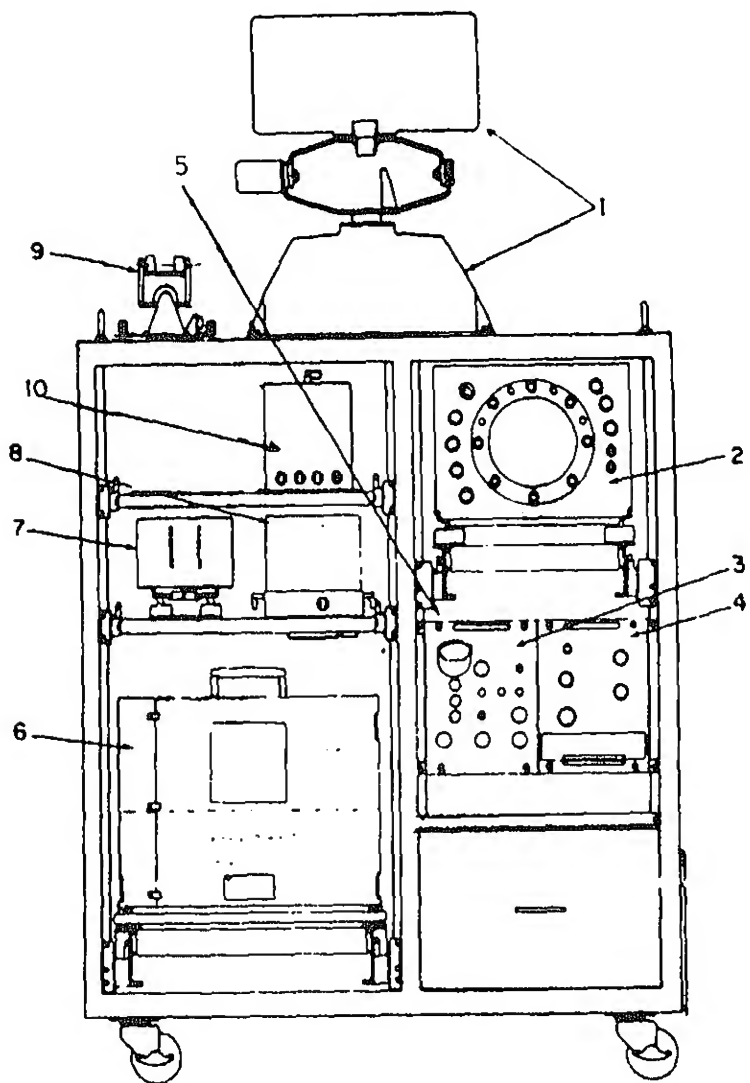
'
and 6. _____

7. _____

8. _____

9. _____

10. _____



Another factor a technician must know is the proper interconnection of the cables between the major units/assemblies. Illustrations and tables are provided that describe the routing and proper connection of the inter-connecting cables.

Refer to the Interconnection and Test Cable Chart and the Interconnection Diagram in the MIM for the radar trainer.

Cable W7 is connected between _____ and _____; cable # _____ is connected between jacks A8J1, and PS1J1.

7. Refer to the MIM for radar trainer. Complete the information for each of the cables listed below.

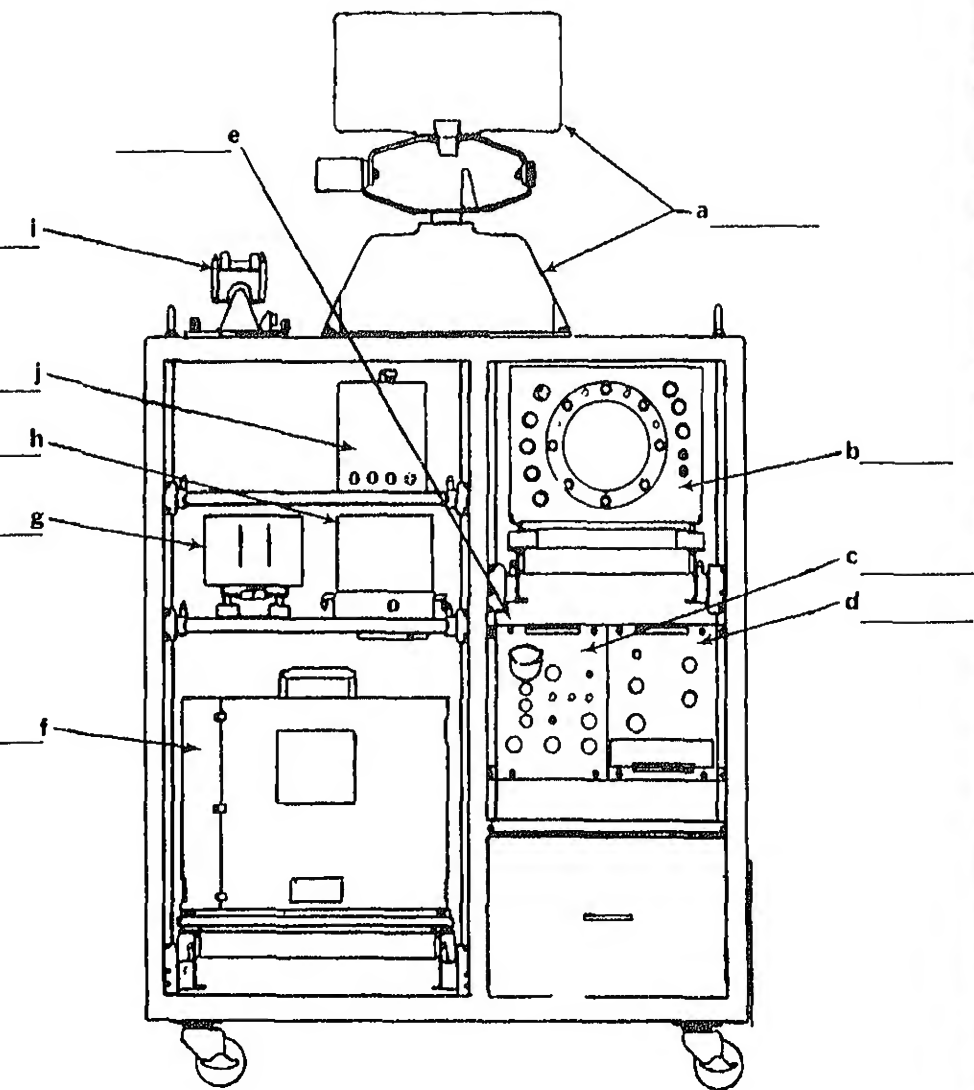
<u>Cable</u>	<u>Part Number</u>	<u>From</u>	<u>To</u>
W3	_____	_____	_____
W8	_____	_____	_____
W12	_____	_____	_____

529260C60158
A1J3
A3J5
529260C60085-12
A6A1J4
A3J2
529260C60155
A5J1
PS1J2

8. A technician should learn the capabilities and limitations of an electronic system to operating it. The Electrical Specifications Table in the MIM contains this information for the radar trainer. List the limit or description for each characteristic listed below.

<u>CHARACTERISTIC</u>	<u>LIMIT or DESCRIPTION</u>
a. rf source	_____
b. RCVR 1&2 crystal	_____
c. i-f frequency	_____
d. local oscillator	_____

ron 9. Refer to the MIM for the Airborne Search
.0ma Radar Trainer and label the major units by
on nomenclature and reference designator.



- a. Antenna Assembly (A1)
- b. Radar Display Indicator (A4)
- c. Radar Set Control (A7)
- d. Antenna Control (A8)
- e. Indicator Low Voltage Power Supply (PS2)
- f. Receiver/Transmitter/Modulator (A6)
- g. Electronic Control Amplifier (A5)
- h. Power Supply Inverter Group (PS1)
- i. Vertical Reference Gyro (A2)
- j. Electrical Synchronizer (A3)

10. There are many times when a technician must rely on the information provided in the MIM of a system to learn the operating procedure for the system. A technician should learn the location of the purpose of the operating controls. There are figures provided in section II of the MIM which depict the nomenclature and location of the controls. Additionally, a table or series of tables is provided in section II, which describes the function of each control and indicator. Refer to the Table of Contents, List of Illustrations, and List of Tables for the figures and Operating Controls Indicators table as necessary to match each control/indicator listed on the following page to its purpose.

10. (Continued)

<u>CONTROL</u>	<u>PURPOSE</u>
a. Test meter (M1)	(1) Selects normal or offset range sweep on CRT.
b. OFF-STBY-ON	(2) Selects the desired range for PPI display.
c. Range Switch	(3) Energizes system and selects system function.
d. NORMAL/DEPRESSED CENTER SWITCH	(4) Monitors current flowing through strategic system elements.

11. Match each control/indicator listed below to the correct purpose.

<u>CONTROL/INDICATOR</u>	<u>PURPOSE</u>
a. Tilt control switch	(1) Controls elevation of antenna.
b. Gyro power switch	(2) Indicates system status
c. COAC ON-OFF switch	(3) Reduces effects of clutter.
d. STBY light	(4) Supplies 26vac, 400Hz excitation to the gyro.

a1, b4,
c3, d2

12. If a technician is assigned a job on aircraft that necessitates installation of a major unit he should refer to the I connection and Test Cable Chart to insure all external cables are properly connected. Refer to the MIM for the radar training complete the following:

<u>Cable</u>	<u>Part Number</u>	<u>From</u>
W6	_____	_____
W10	_____	_____
W19	_____	_____

13. Refer to the Electrical Specifications Table in the MIM for the Airborne Search Radar Trainer and list the limit or description in the appropriate blanks below.

CHARACTERISTIC	LIMIT OR DESCRIPTION
a. Input Power	
b. Warmup time for magnetron	
c. Transmitter frequency	
d. Average out- put power	
e. Pulse Repeti- tion Frequency	
f. Duty Cycle	
g. Receiver Sensi- tivity	
h. Receiver i-f frequency	
i. Type of local oscillator	
j. Type of display indicator	
k. Antenna oper- ation rate (1) scan (2) sector	

- a. 3 phase,
60Hz,
115 vac
- b. 5 minutes
- c. 9375 MHz
ADJUSTABLE
8800-9600
MHz
- d. 0.3-1.0w
- e. 1kHz +
25 Hz
- f. 0.001
- g. -90dbm
- h. 30 MHz
- i. Klystron
- j. PPI, DE-
PRESSED
CENTER
FUNCTION
- k. 1.6rpm +
10%

2. Variable
40-140
+ 2⁰ @
3 rpm

14. A preflight inspection consists of the essential parts, an overall check of material condition and an operational check. The material condition is determined by performing a visual inspection of the installation. The inspection should be accomplished in accordance with the Inspection Procedures.

Prior to performing an operational check, the technician should perform the Initial Control Settings of the system being checked.

Locate tables 3-3a and 3-3b and list the titles of each part.

3-3a _____

3-3b _____

15. Refer to section III of the MIM for the 15A21 radar trainer.

List the two major sub-divisions of the Pre-flight Inspection Tables.

3-3a. _____

3-3b. _____

In-
n
res

s

16. Correct operation of a system is imperative either during flight operations or during system maintenance. Therefore the technician should become familiar with the operating controls and the indications for specific control settings.

Refer to table 2-6 and figure 2-16 in the MIM. Which light will be illuminated when the OFF- STBY-ON switch is in the ON position? _____

ON light

17. Refer to the Interconnections and Test Chart (table 2-5) in the MIM for the trainer and complete the following table.

CABLE NO.	PART NUMBER	FROM	
1. W _____	60153	A1J2	
2. W9	60085-13	_____	
3. W _____	60165	_____	
4. W20	_____		

1. W2, A5J3
2. A6A1J3,
A3J3
3. W16, A7J1
4. 529600-
C60174

18. After performing the visual inspection of the initial control settings, the next step of a preflight is the operational check. An operational check is also performed after completing other inspections, before maintenance action to verify a malfunction and following maintenance action to insure the malfunction has been corrected.

The operational check procedures are described in section III of the MIM for the trainer.

18. (Continued)

The operational check in the MIM consists of _____ columns, entitled _____, _____ and _____.

19. Circle the major steps that are listed in the operational checks table.

- a. Initial checks
- b. Antenna mode checks.
- c. Receiver checks
- d. Preflight checks
- e. Waveguide checks
- f. Tilt checks
- g. Display checks
- h. Intensity checks
- i. Vertical Stabilization checks
- j. Transmitter checks
- k. Daily checks

P.I.

Module 5-1
Lesson Top

a, b, c, f,
g, h, i, j

20. Two important parts of a preflight inspection are determining:

1. material condition, and
2. the operational condition of the system.

List the two parts of the preflight inspection for the radar trainer which should be performed prior to turn-on.

Refer to section III of the MIM.

a. _____.

b. _____.

a. Visual Inspection Procedures

b. Initial Control Setting

21. Refer to table 2-6 and figures 2-14 a and b in the MIM for the radar trainer. Set the control settings that cause the STBY to illuminate and the antenna to scan an equal number of degrees each side of center.

- a. Power switch at ON, ANT Heading switch at ANT mode switch as SCAN.
- b. Power switch at STBY; ANT Heading switch at ANT Mode switch as SCAN.
- c. Power switch at STBY; ANT Heading switch at ANT mode switch at STOP.

22. A technician may find that the system does not function properly during an operational check. To determine the cause of the malfunction, the technician will perform further checks that are necessary to determine the cause of the trouble.

The technician should carefully evaluate the operation and visual indications of the system under test during the operational check and then determine the additional checks and tests to perform.

The Functional Checks Table is located in section III of the radar trainer MIM and lists the most frequent malfunctions or more difficult malfunctions that occur.

The Functional Checks table consists of four columns:

1. The FAULT column lists the faults.
2. The Probable Cause column lists the probable defect for each fault.
3. Major Test Points column lists the major test points that should be checked for each fault.
4. The Corrective Action column lists the recommended corrective action to be taken

22. (Continued)

Refer to the Functional Checks table and the major test points to check if there are no range marks.

6
23

23. List the major test points for a fault condition of unequal spacing between the marks.

2, 111, 112

24. An operational check is performed to determine the operational condition of an electronics system. It should be done in accordance with the Operational Check procedures specified in section III of the MIM for the system being checked.

24. (Continued)

Refer to the Operational Checks Table in the radar trainer MIM. Select the major steps listed in the Procedure column of the Operational Checks Table.

- a. Daily checks
- b. Transmitter checks
- c. Vertical stab checks
- d. Intensity checks
- e. Display checks
- f. Tilt checks
- g. Waveguide checks
- h. Preflight checks
- i. Receiver checks
- j. Antenna mode checks
- k. Initial checks

e, 25. Refer to the MIM for the Airborne Search
k Radar Trainer Device 15A21. List the two
major sub-divisions of the Pre-flight
Inspection tables.

- a. _____
- b. _____

- a. Visual Inspection Procedures
- b. Initial Control Settings

Once the location reference designator has been identified, the next step is to determine the test point location by interpreting the reference designator code.

The following is a breakdown of an example reference designator to show what each part represents.

Reference designator	A3 A3 TB
major unit	_____
circuit card or module	_____
Terminal board #1	_____
Pin #5 of terminal board #1	_____

Some test points are located external to the major unit and use test jacks. These test jacks are identified in a similar manner.

Reference designator	<u>A4</u>	<u>TP-1</u>
Major unit	_____	_____
Test point #1	_____	_____

When it is necessary to check a test point on a card, the following example applies:

Reference Designator	<u>A6</u>	<u>A1</u>	<u>A1</u>	<u>TB1-1</u>	<u>1</u>
major unit	_____	_____	_____	_____	_____
sub-assembly	_____	_____	_____	_____	_____
circuit card or module in sub-assembly	_____	_____	_____	_____	_____
Terminal board #1	_____	_____	_____	_____	_____
Pin #1 of terminal board #1	_____	_____	_____	_____	_____

In this example, the actual test
be at an input/output connector,
etc.

The following designators are com

TP - - - test point

TB - - - terminal board

X- - - - circuit card or subunit
connector

E- - - - voltage test point

J- - - - jack

S- - - - switch

NO RESPONSE REQUIRED

26. Once the major test point or test
is/are determined for a specific
next step is to determine the loc
each test point. In the MIM for
trainer, a table provides a list
major test points which specifies
test point, location designator a
cription of the normal indication
List the location and description
test points 6 and 23.

27. The location and description of major test points 63 and 116 are:





28. When a technician determines that an avionics system does not meet performance requirements, the next step is to determine the cause of the trouble. Organizational maintenance consists mainly of isolating malfunctions to a defective major unit, and performing the required corrective maintenance.

Section III, Organizational Maintenance, provides a Functional Checks Table to provide guidance in performing the troubleshooting process to isolate a malfunction to a defective major unit.

28. (Continued)

Refer to the Functional Checks table
list the major test point(s) to check
the following fault.

FAULT

MAJOR TEST POINT

No range marks

_____, _____

6, 23

29. Refer to the Operational Checks table
MIM. Circle the major steps from the
list, that are listed in the Procedure
column.

- a. Initial checks
- b. Preflight checks
- c. Display checks
- d. Daily checks
- e. Antenna mode checks
- f. Tilt checks
- g. Receiver checks
- h. Vertical stabilization checks
- i. Waveguide checks
- j. Intensity checks
- k. Transmitter checks.

e, f,
j, k

30. Section III of the MIM for the radar trainer provides a table entitled "Functional Check Major Test Point Waveforms" which consists of three columns. The Test Point column lists the major test points in numerical order. Major test points are star enclosed Arabic numbers.



The second column lists the Location Reference Designator for each test point and the Waveform/Normal Indication column lists the waveform or voltage value for each test point.

Refer to table 3-8 in the MIM. The location designation for the following is



_____.

P.I.

Mod
Les

47 +.2v
7 + 12vdc

32. The listing of the major test
information on the location a
indications of each major tes

Determine the location and de
major test points 3 and 120.



LOCATION

DESC



3 A3A2TB1-6
1kHz Sync
trigger

120
A6A1A1TB1-5
+225-250vdc
input to mod

33. Circle the major test points
on the Functional Checks tabl
FAULT stating that the antenn
rotate in SCAN mode.

- a. None
- b. 72, 85
- c. 85, 91
- d. 91, 98, 117

34. Intermediate maintenance is more involved than Organizational maintenance. A technician must be able to perform troubleshooting steps necessary to isolate the cause of each specific malfunction to a module, stage, circuit, and often to a component in a circuit.

Section IV of a MIM provides the necessary information to maintain a system at the intermediate level of maintenance.

The secondary test point tables are in section IV of the MIM. These test points are identified by a capital letter enclosed in a circle, i.e. (A)

The Secondary Test Points and Indications table in section IV of the MIM consists of two columns. The Test Point and Location column lists the secondary test points and the reference designator for each secondary test point. The Indication column lists the nomenclature of the signal and specifies or illustrates the normal indication for each test point.

The reference designator for second test point (A) is _____

A1 TP-3




35. List the nomenclature for second point (H) _____

AZ tach signal.

36. The Functional Check - Major Test Waveforms provides information as to location and the waveform or normal indications of the major test point.

- a. PS2-TP8 is the location of test point 12. What is the normal indication for this point? _____
- b. A4-TP1 (major test point 18) two waveform indications shown. What is the P/P amplitude of each waveform? _____

37. Refer to the Listing of Major Test Points table. List the reference designator and description for the major test points listed below.

- a.  _____
- b.  _____
- c.  _____

38. Another group of test point symbols is included in section IV to identify test points that are used to perform measurements within stages, circuits, or electrical components such as switches, synchros, motors etc.

Minor test point symbols consist of a capital letter followed by an Arabic numeral enclosed in a circle, as shown in the following examples:

(A1)

(A2)

(A3)

etc.

(B1)

(B2)

(B3)

etc.

38. (Continued)

As shown, minor test points are sequenced alpha-numerically. Typical examples of test points are signal injection and test points of a stage/circuit for a check measurement of gain, specific voltage, resistance test points, and other points used in checking for a trouble in a specific circuit.

The Minor Test Points table in section the MIM is arranged in sequence by units.

Refer to the Minor Test Points table the reference designation for each of test points listed below.

<u>TEST POINT</u>	<u>REF. DESIG.</u>	<u>INDIC</u>
a. (A1)	_____	81kHz s
b. (B3)	_____	composi
c. (B9)	_____	resolve

Section IV of the MIM.

List the Reference Designator and the Nomenclature for:

	TP	REFERENCE DESIGNATOR	NOMENCLATURE
a.	(B1)	_____	_____
b.	(B11)	_____	_____
c.	(C3)	_____	_____



40. Section IV, INTERMEDIATE MAINTENANCE, in a MIM provides the necessary information to perform troubleshooting, circuit alignment, and repair of internal circuitry of major units.

Secondary test points in the MIM for the radar trainer are easily identified on block, schematic and wiring diagrams by a symbol, such as (A), (B), etc, a capital letter enclosed in a circle.

A table in the MIM for the radar trainer entitled "Secondary Test Points and Indications Table," provides a listing of applicable secondary test points.

40. (Continued)




Refer to the secondary test point table in the MIM and complete the following:

	TEST POINT	LOCATION	
a.		_____	Freq. of signal _____
b.		_____	time of saw-tooth slope for 25/5 range _____

1A1MG1-8,
400 Hz.

A3A2TB1-2,
320 usec.

41. Refer to the Functional Check-Major Test Point Waveforms and list the information required for each of the below major test points.

- a.  PRT= _____.
- b.  Sweep amplitude = _____.
- c.  _____ vdc to modulator.

000 usec
4.3 volts
225-250vdc

42. Maintaining avionics systems in top-notch condition is often very difficult. To reduce this difficulty, outlined procedures for troubleshooting, performance testing and alignment are provided in section IV

42. (Continued)

Each major unit has the performance tests and alignment procedures combined so that each abnormal indication may be corrected. Refer to the Performance Tests and Alignment Procedure in the MIM and complete the following statements.

Which paragraph describes the performance tests and alignment procedure for the:

- a. Synchronizer unit _____.
- b. Display-indicator _____.
- c. Transmitter section _____.

43. When aligning the synchronizer, you check the Range Marks. The 2-20 Range Control is fully CW, and the Range Switch is set at 2-20/1.

- a. at A3A3 TB1-7 you have 250 microse-
conds. This is a normal/abnormal
indication. (circle one)
- b. at A3A3 TB1-1 you have 14.48 micro-
seconds. This is a normal/abnormal
condition. (circle one)

b. abnormal

to a stage, circuit, or part are made a
minor test points. Minor test points a
identified by a capital letter followed
by an arabic numeral, (A1) (B1) (C1)

Refer to the minor test point table in
MIM and list the nomenclature and locat
code for each of the minor test points
listed below.

	LOCATION	NOMENCLATURE
a. (B6)	_____	_____
b. (D4)	_____	_____
c. (B11)	_____	_____

and Indications Table in the MIM. Label the following test points with their location and indication.

	LOCATION	INDICATION
a. (A)	_____	_____
b. (M)	_____	_____
c. (AA)	_____	_____

46. Many troubles in an avionics system cannot be corrected by performing adjustments/alignments because a component has failed. When a component has failed, it must be located; then repaired or replaced as applicable.

Section IV of a MIM for an aircraft provides troubleshooting charts for the systems installed in the aircraft.

Section IV of the MIM for the radar trainer has a separate troubleshooting table for each major unit. The test points in each table lists the test points necessary to isolate each malfunction to an applicable

circuit, card, or stage.

Refer to the Synchronizer Troubleshooting and Display-Indicator Troubleshooting tables.

List the corrective action for troubles specified below.

a. SYNCHRONIZER.

TROUBLE	PROBABLE CAUSE
Loss of 1 kHz output.	step 2a

b. DISPLAY INDICATOR.

TROUBLE	PROBABLE CAUSE
No video	step 2.

he A3A1
ard.

epair/
eplace
he video
ain con-
rol card

in the MIM. Complete the chart below with
the probable cause and corrective action
for the troubles listed.

a. Modulator A6A1 Troubleshooting.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No 1kHz output in system operation mode.	1.	1.

b. Receiver-Transmitter A6A2 Troubleshooting.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Manual tune inop.	1.	1.

c. Power Supply Inverter PS1 Troubleshooting.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No 22.5 vdc output	1.	1.

ERS:

Systems Independent Operation Switch; Replace A6A1A1 card.

Defective AFC Integrator A6A2A9; Replace A6A2A9.

Defective Power Supply; Replace F1 on Power Supply.

48. Outlined procedures for troubleshooting performance testing and alignment of the radar system are found in section _____ of the MIM.

If, for instance, you wanted to determine the transmitter operating frequency, the test equipment used to make the measurement is the _____. The indication observed is _____

TS488A

maximum
meter deflection on the
echo box
meter while
tuning the
TS488A tuning control
knob.

49. Refer to the Minor Test Points in the MIM and list the location and function for the following test points.

LOCATION

a. (A1) _____

b. (A5) _____

c. (B10) _____

contains functional diagrams, wiring diagrams, and schematic diagrams.

The functional diagrams depict the major signal flow paths between the major units of the avionics system.

Refer to the functional block diagram in the MIM for the radar trainer.

List the inputs to the synchronizer unit.

a. _____.

b. _____.

c. _____.

d. _____.

e. _____.

51. Refer to the Functional Block Diagram (sheet 1 of 9). The Bootstrap sweep return is an output of the A4 Unit.

TRUE/FALSE.
(circle one)

useful to a technician in the is
of a malfunction to a module/cir
stage, or circuit component. Th
shooting tables in section IV ar
for each of the major units of t
trainer. Refer to the Display-I
Troubleshooting table.

There are no range marks on any
is the corrective action if majo
point 23 checks normal and secon
point (M) checks abnormal?

Replace the
A47¹ card.

53. Refer to the Performance Tests a
ment procedure in the MIM. Comp
following specifications concern
dual units within the airborne s
trainer.

- a. Negative Sweep Gate A3A2 TBL
Range. PW= _____
- b. Transmitter (Magnetron) Freq
_____ + MHz.

and are used to show the signal/voltage distribution between major units and between subassemblies or modules within major units. (Refer to the Power Distribution Diagram.)

The signal/voltage is identified for each wire in the interconnecting cables shown on the power distribution diagram. Each cable is identified by a code; W1, W2, W3, etc. Jacks are identified as J1, J2, J3, etc. and are normally connected to corresponding plugs, identified as P1, P2, P3, etc.

The wires in each cable are attached to male or female connectors in the plugs at each end of the cable. Each connector in the plug and jack is identified by upper or lower case letters.

Refer to the Power Distribution Diagram.
List the signal/voltage or other information shown on the lines between the designated cable and pin connector.

	CABLE	PIN CONNECTORS	SIGNAL VOLTAGE
a.	W19	E of P1-P2	_____
b.	W10	L of P1-P2	_____

a. 115 vac
60 Hz Lo.
b. +300 vdc.

55. Refer to the Power Distribution Diagram.
Device 15A21.

List the input voltages applied through W17 to the low voltage power supply from the Radar Set Control, Unit A during system operation.

to another can be easily seen by referring to the Functional Block Diagram.

If someone were to say that the 15A21 radar trainer has a 208v, 3 phase power input, would they be telling the truth? YES/NO. If yes, where is the input applied? If no, what is the input power?

57. Refer to the appropriate unit troubleshooting tables in the MIM. List the probable cause and corrective action for:

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Loss of the 1 kHz output.	1.	1.
	2.	2a.
		2b.

ANSWERS:

Probable cause:

1. Synchronizer Power Supply fuses F1, F2, F3, F4.
2. Output of resolver Driver Card A3A1.

Corrective action:

1. Replace fuses.
- 2a. Replace A3A1 card.
- 2b. Repair/replace XA1.

58. After the troubleshooting of an a
system has been completed, the de
tative major unit, module/circuit o
component part must be repaired o
placed.

An Illustrated Parts Breakdown (I
provided for aircraft and avionics
This lesson topic provides an exp
of an IPB for avionics systems us
IPB for the airborne search radar
as an example. The format of an
sists of four sections: 1. Sec
the Introduction; 2. Section II
Group Assembly Parts Lists; 3.
is a Numerical Index and; 4. Sec
is the Reference Designator Index
section I of the IPB before proc

is The Group Assembly Parts List which consists of figures and tables.

The figures are used to depict the physical location of components in the major units and the modules/circuit cards. When it is necessary to locate a component part, refer to the table of contents for section II to determine the figure and page number for the major unit, module/circuit card in which the component, is

located. As an example of this; suppose that the antenna reflector is damaged and you need to determine the part number and

description so that a new antenna reflector can be ordered. The table of contents lists figure 1, sheets 1 and 2, on pages 2-1 and 2-2 respectively. Figure 1, sheet 1 of 2, depicts the antenna reflector which is identified as INDEX number 2.

The second part of The Group Assembly Parts List is a table consisting of four columns entitled: 1. Figure and Index Number; 2. Part Number; 3. Description;

and 4. Units per assy (assembly)

The Figure and Index Number column
all the index numbers for the component
illustrated in the referenced figure. For
example; the antenna reflector is located
and its index number is 2; located in
the Figure and Index Number column
part number is listed in the column
mediately to the right. In this example
the part number is 2803-1. The description
is; Reflector, Antenna; A1 (52926)
as shown in the Description column
as shown in the Unit per Assy column
there is 1 reflector.

Refer to the group assembly parts
the IPB and list the part number
waveguide horn assembly, item 12
side view _____.

is defective and needs to be replaced. List the information in each of the blank spaces, as shown in the group assembly parts list of the IPB.

- a. Figure and Index number _____.
- b. Part number _____.
- c. Description _____.
- d. Units Per Assy _____.

60. Refer to the Power Distribution Diagram, Device 15A21.

The 26 vac and 115 vac, 400 Hz applied to the Antenna Control, Unit A8, is from:

- a. Radar set control.
- b. Antenna A1 unit.
- c. Inverter power supply, PS1 via W19.
- d. Simulated vertical reference gyro, A2.

Airborne Search Radar Trainer. M

point 6 is the

- a. bootstrap sweep return to the
- b. range marks video out of the
nizer.
- c. composite stabilization signal
- d. pitch reference.
- e. AFC crystal current.

b.

62. There are situations when a technician is given a part number for a component and is asked to determine the physical location and the description of the component. This is done by using the Numerical Index, Figure III of the IPB, to cross reference the Figure and Index number. Refer to Figure III and locate part number 5292600. Notice that the Figure and Index number are 1-12. When two or more Figure and Index numbers are given the number used is the one from the Board, Card, or Assembly work. Now go back to the Group Assembly Parts List. You may go directly to the figure to determine the location,

62. (Continued)

go to the table and look up the description and units per assembly.

In the above example 1-12 is the

_____ , _____ ;

_____ GHz, average

power _____ .

63. Material Control wants the description and the Figure and Index number of a part that was previously ordered for the A3A1 Resolver Driver Card.

The part number is RCR07G201JS. List the figure and index number, _____ and the description, _____

_____ .

Resistor,
fixed,
composition;
200 + 5%,
1/4 watt.

defective and needs to be replaced. See
the list below, the information that is
in the Group Assembly Parts List.

	Figure & Index No.	Part No.	Descrip- tion
a.	1-27	CPV09A1KE184km	Capacitor Fixed
b.	1-28	CH09A1NC475k	Capacitor Fixed
c.	1-29	CH09A1NC335k	Capacitor Fixed
d.	1-30	CH09A1NE224k	Capacitor Fixed

c.

65. Refer to the Power Distribution Diagram
Device 15A21.

The input voltage to the modulator power supply
is routed from the radar set control voltage.

- a. W14.
- b. W18.
- c. W15.
- d. W16.

on an avionics system, he often knows the reference designator for a component that needs to be replaced. For example, if a technician is troubleshooting the sweep generator card and discovers C4 is defective. The complete reference designator for C4 is A3A2C4 since it is located on the A2 card of major unit A3.

The Reference Designation Index, section IV in the IPB, provides a listing of the reference designators in alphanumerical sequence with the applicable part number and figure and index number listed for each reference designator. The part number for A3A2C4 is listed as: CQ09AlMA333J3 and the figure and index number is listed at 6-9 .

The technician can use this information to determine the description as stated in the group assembly parts list.

The part number for A3A2C4 is listed
section IV as CQ09A1MA333J3 and the
figure and index number is

List the part number and figure and
number for A3A1C7.

a. Part number _____

b. Figure and index number. _____

- a. M39003-01- 67. A technician discovers that the A3A1
2353. (resolver driver card) is beyond repair
and must be replaced.
- b. 5-11.

List the part number and description.

a. Part number _____

b. Description _____

known and additional information is needed about that part, the technician should refer to the Numerical Index to cross over to the figure and index number. Then, look up the location or description in the Group Assembly Parts List.

Where is the part number 529260C60030 located and what is its description?

Location _____.

Description _____.

69. A technician finds that the range marks generator card has been damaged and must be replaced. Refer to the IPB and select from the list below the correct information listed in the group assembly parts list.

	PART NUMBER	DESCRIPTION
a.	529260C60033	Printed board.
b.	529620C60303	Printed wiring board.
c.	529260C60033	Integrated Circuit.
d.	529260C60033	Circuit Card Assembly.

reference designator of a major unit, module/circuit card/assembly or component, he can refer to the Reference Designation Index to obtain the part number figure and index number. The figure and index number can be used to determine the description listed in the Group Assembly Parts List, section II of the IPB.

List the description and part number of the component represented by A4A2CR1.

- a. Description _____.
- b. Part Number _____.

a. Semiconductor device, Diode.

b. 1N914.

71. Refer to the IPB and select from the list below the correct component location and component description that is represented by part number 529260C60035.

- a. Display-indicator, resistor, fixed.
- b. Synchronizer unit capacitor, 100 pF.
- c. Synchronizer unit, Circuit Card Assembly, Generator, sweep.
- d. Synchronizer unit, Printed wiring board.

Select the part number and component description from the list below that is represented by A4A2U1 designator.

- a. U5B770939X, Integrated circuit.
- b. U5B780949X, Integrated transistor.
- c. U5B771031X, Integrated circuit.
- d. 529260C10097, Printed Wiring board.

At this point, you may take the lesson topic progress check. You may find it beneficial to review the objectives for this lesson topic. If you answer all self-test items correctly, go on to the next lesson topic. If not, select and use another medium of instruction, narrative, or consultation with the learning supervisor, until you can answer all self-test items on the progress check correctly (achieve lesson topic learning objectives) and then proceed to the next lesson topic.

AVIONICS TECHNICIAN COURSE, CLASS A1

UNIT 5

MODULE 1

LESSON TOPIC 3

INTERCONNECTING WIRING DIAGRAMS

INTERCONNECTING WIRING DIAGRAMS

on you will learn about the importance of interconnecting
ams to the maintenance technician in the performance of
ntenance tasks. You will learn how to use the information
the interconnecting diagrams.

objectives for this lesson are as follows:

from a list, the information shown on an interconnecting
, given a maintenance instruction manual of the airborne
radar trainer.

from a list, the information shown on the interconnection
t cables table, given a maintenance instruction manual of
borne search radar trainer.

from a list, the cable identification numbers for designated
between the major units of the airborne search radar trainer
, given the plug/jack reference designators and MIM.

o the interconnecting diagrams in the airborne search radar
MIM. Match specified voltages and signals to the proper
ce designator for the interconnecting cable or plug/jack
or.

bjectives in this lesson topic must be accomplished with
ercent accuracy, unless otherwise stated.

inning this lesson topic, carefully review the "List of
ces". Keep in mind that your learning supervisor can be
uable learning resource. Always feel free to consult with
ave problems or questions.

To learn the material in this lesson topic, you may choose, according to your experience and preferences, any or all of the following lesson topic presentations.

WRITTEN LESSON TOPIC PRESENTATIONS IN MODULE BOOKLET:

1. Lesson topic summary.
2. Programmed instruction form of lesson topic.
3. Narrative form of lesson topic.
4. Lesson topic progress check.

ADDITIONAL MATERIALS REQUIRED FOR SUCCESSFUL COMPLETION OF LESSON TOPIC:

1. Job program in Job Program Booklet
2. Student response sheets
 - a. Job Data sheet.
 - b. Answer sheet for use with test.
 - c. Programmed instruction response sheets.

ENRICHMENT MATERIALS:

1. Airborne Search Radar System Training Device (15A21)
Maintenance Instruction Manual

All the resources listed above are available and may be used as they fit. Your learning supervisor represents a most valuable learning resource. Use him when you need help. It is not necessary to use all the resources to achieve the learning objectives for the lesson topic. The lesson topic progress check is your means for determining when you have achieved the objectives. The progress check may be taken at any time and is graded by you. If you fail to achieve any objective at the lesson topic level, you will plan and accomplish your own remediation. If you need help in remediation planning, consult your learning supervisor.

Interconnection Diagram figure 2-3 in the MIM, provides the following information:

- Illustration that depicts the relative position of the major units.
- Cables between the major units.
- Plug/jack connectors on the major units.

Interconnection and Test Cables Chart (table 2-5 in the MIM) provides the following information:

- Reference designators.
- Number for each cable.
- Jack reference designators.

The numbers shown on the Interconnection and Test Cable tables correspond to the numbers printed on the cables. When performing maintenance on the system, care must be taken to insure that all cables are connected as shown in the table to prevent incorrect operation or damage to the equipment. The Interconnecting Wiring Diagram for the radar system, figure 5-3, (pages 1, 2, and 3) lists the reference designator and nomenclature for each unit. Additionally, each interconnecting cable is identified by a reference designator, and each wire is labeled with the appropriate voltage or waveform for that wire.

At the end of this point, you may take the Lesson Topic Progress Check. If you can answer all self-test items correctly, go on to the next Lesson Topic. If you cannot, select and use another medium of instruction for the Lesson Topic: Directed Instruction, Narrative, or consultation with Learning Supervisor. Continue until you can answer all self-test items on the Progress Check (achieve Lesson Topic Learning Objectives) and then proceed to the next Lesson Topic.

When troubleshooting, technicians are required to determine malfunction within a given avionics system. Following an open check, further checks are made which may include signal tracing, continuity checks, and visual checks. When the cause of the malfunction is determined, the appropriate corrective action is taken.

This lesson topic provides an explanation of the tables and MIM that should be used as a guide to hook-up the cables between units to perform signal tracing or continuity checks between the major units of an avionics system.

The relative location of the ten major units that make up the search radar trainer can be determined from the Interconnection figure 2-3 (front and rear views) located in the MIM. Similar diagrams are used in the maintenance instruction manuals for actual aircraft to aid technicians in determining the location of each unit or given system that is installed in that aircraft.

The rear view of figure 2-3 depicts the reference designators for the major units. These reference designators are also used in the individual illustrations of the major units (figures 2-4 through 2-9), schematic diagrams, and wiring diagrams.

On the rear view of figure 2-3 each plug/jack connector on the units is identified by an appropriate reference designator. The reference designator for a jack is J (J1, J2 etc.), and the reference designator for a plug is P (P1, P2 etc.). The external plug/jack connectors are used for the attachment of the interconnecting cables which are used to connect the units and voltages between the major units.

The proper routing of the interconnecting cables between the units is represented by lines drawn between the plug/jack connectors. This data is commonly used in troubleshooting an avionics system in an aircraft. Use of the interconnection diagrams can save time and frustration because in most aircraft a cable for a given avionics system may be hidden in a bundle of cables that share a common path in the aircraft.

Table 2-5 in the MIM for the radar trainer consists of part of the interconnection of the cables between the major units of the system. Table 2-5 lists the special test cables. Table 2-5 should be used with figure 2-3 when connecting the cables between the major units. The reference designator for each interconnecting cable is listed in the third column. These reference designators are also used on the interconnection wiring diagrams in section V of the MIM.

digits also apply to the other part numbers. The part number is essential when ordering a new cable or for reporting action after performing repairs.

The designators that represent the plug/jack connectors, between interconnecting cables are attached, are listed in the two on the right side of table 2-5A.

Work of installing the interconnecting cables between the major radar system, a technician should compare the reference design cable with those listed in table 2-5A. Next check the plug/jack designators to insure proper connection between the major

units and the appropriate plug/jack connectors that cables are attached to.

Major Unit Designators	From	To
_____	_____	_____
_____	_____	_____
<u>A1</u>	<u>A6A2J4</u>	<u>A1E2B</u>
<u>PS2</u>	<u>A4J2</u>	<u>PS2 J2</u>

Wires are used by technicians to signal trace or to make continuity tests on wires or cables that are connected between major units, or between modules/circuit cards within major units.

Because of the numerous wiring diagram configurations, the complexity of a wiring diagram is determined by the data that is shown. For example, one of the MIM for the radar trainer, figure 5-2 is a power distribution diagram.

Figure 5-10 is an interconnecting wiring diagram showing interconnection of the major units of the system; and figure 5-11 is an interconnecting wiring diagram showing the interconnection of subassemblies/modules and circuit cards within a major unit.

Figure 5-12 shows the voltage distribution between the major units. This wiring diagram is especially helpful in determining the input voltages of each unit within the system. This type of wiring diagram is a tremendous asset to a technician in performing continuity tests on the interconnecting cables between the major units of an avionics

jack connectors. The jack connectors, designated J1 and J2, are connected to the plug connectors, P1 and P2 respectively. P1 is part of cable W17 and P2 is part of cable W10. Each pin in the plug/jack connectors is labeled with an upper or lower case letter or in a sequence. On sheet 1 of figure 5-3, J5 on the A6 unit and J2 on the A2 unit have lower case letters that identify each pin. Jack cabinet uses numbers for identification of the pins. The plug/jack connectors use upper case letters.

On the lower left hand corner of figure 5-3, sheet 3 of 3. On sheet 3, the function of each wire is labeled. Cable W15 is connected to J5 on the Radar Set Control A7 unit and A6AJ2 of the MOD-ROUPE in the A6 unit.

Wiring diagrams are used for a complete major unit or to depict signals, voltages and control paths within the major

figure 5-11 in the MIM which is an interconnecting wiring diagram for the radar display indicator, A4 unit. Wiring diagrams for a given unit differ very little from those for a complete system. Each of the units, subassemblies or circuit cards are identified by a box with solid lines.

The difference is that each connector of a circuit card consists of two characters. For example, the connections on the video amplifier and the CRI control card are XA1 and XA2 respectively.

For more sheets are used for a given major unit, letter designators are used to show continuity of signal, voltage, or control paths. For example on figure 5-11, (sheet 1 of 2), the + 12 vdc ground circuit is connected to pin 4 of XA1, pins U and T of XA2 and to pin H of J2. The letter for these points is designated (a). Locate (a) on the left side of the next sheet, figure 5-11 (sheet 2 of 2), notice that (a) is connected to pin 15 of XA4, and pins 15 and W of connector XA3.

The method used to aid technicians in chasing signals or control paths from one sheet to another is that each signal or control path is labeled. On the left-center of figure 5-11 (sheet 1 of 2) the "X" sweep feedback input signals are applied to pins A and W respectively. Refer to sheet 2 of 2 of figure 5-11, the origin of the "X" sweep feedback is obtained from the circuit at the right center of the sheet. The origin of the "Y" sweep feedback is obtained from the circuit at the lower right of the page.

select and use another medium of instruction for the Lesson Topic.
Programmed Instruction, Summary, or consultation with the Learning
Supervisor, until you can answer all self-test items on the Programmed
Check correctly (achieve Lesson Topic Learning Objectives) and
proceed to the next Lesson Topic.

INTERCONNECTING WIRING DIAGRAMS

INTRODUCTION

Countless times each day in Naval Aviation, technicians encounter aircraft wiring problems such as broken wires in the middle of wire bundles, wires shorted together, or wires shorted to ground.

The first thing a good technician will do is refer to the aircraft or system interconnecting wiring diagrams. By knowing how to use and understand the information contained in the interconnecting wiring diagrams, the technician can cut maintenance time significantly and help increase aircraft system reliability.

This programmed instruction will give you a basic understanding of the use of the interconnecting wiring diagrams and the information contained in the interconnecting wiring diagrams.

1. Wiring diagrams are designed to provide the electrical and electronic data necessary for clarification of the power distribution, control paths, and signal paths, necessary for making continuity checks and troubleshooting between the major units/assemblies of an avionics system.

Many avionics systems installed in an aircraft

are very complex, often consisting of numerous units and assemblies. To facilitate maintenance, interconnecting wiring diagrams are normally included in maintenance instruction manuals to show the data transferred between units or assemblies in the system.

The organizational and intermediate maintenance technicians are often required to isolate faults that occur in the interconnecting cables. The interconnecting wiring diagrams in section V of the manual for the airborne search radar trainer MIM are similar to those found in the MIM of an actual system installed in an aircraft. A technician often must determine the routing of the cables between the major units in a system. An interconnection diagram is normally provided in a MIM to depict the relative positions of the major units, the cables between the units and the plug/jack connectors on the units.

Examine figure 2-3 in the MIM of the radar trainer. The major units are illustrated in their relative positions and are identified by the applicable reference designators.

The interconnecting cables are represented

lines between the plug/jack connectors on the applicable major units.

Refer to figure 2-3 in the airborne search radar trainer MIM.

The major units and plug/jack connectors are illustrated and are identified by the applicable

_____.
The cables are represented by _____ between the applicable plug/jack connectors.

2. Refer to figure 2-3, the Interconnection diagram of the airborne search radar trainer.

List the information shown on the interconnection diagram.

- a. The illustration of the airborne search radar trainer depicts the relative position of the

- b. _____
_____ are used to identify the major units and plug/jack connectors.

- c. _____ represent the cable connected between plug/jack connectors on the major units.

are very complex, often consisting of numerous units and assemblies. To facilitate maintenance, interconnecting wiring diagrams are normally included in maintenance instruction manuals to show the data transferred between units or assemblies in the system.

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Examine figure 2-3 in the MIM of the radar trainer. The major units are illustrated in their relative positions and are identified by the applicable reference designators.

The interconnecting cables are represented

lines between the plug/jack connectors on the applicable major units.

Refer to figure 2-3 in the airborne search radar trainer MIM.

The major units and plug/jack connectors are illustrated and are identified by the applicable

_____.

The cables are represented by _____ between the applicable plug/jack connectors.

2. Refer to figure 2-3, the Interconnection diagram of the airborne search radar trainer.

List the information shown on the interconnection diagram.

- a. The illustration of the airborne search radar trainer depicts the relative position of the

_____.

- b. _____

are used to identify the major units and plug/jack connectors.

- c. _____ represent the cable connected between plug/jack connectors on the major units.

b. Reference
designators

c. Lines

interconnection of the wires or cables b
the major units/assemblies is provided i

"Interconnection and Test Cables Table."

is located in section II of the MIM for
airborne search radar trainer.

Table 2-5 consists of two parts: table 2
data for the interconnecting cables used
normal operation; table 2-5B lists the d
the test cables.

The data is provided in four vertical co
Beginning on the left of the tables, the
column lists the reference designator in
order, W1 through W20.

The second column lists the part number
cable. The third and fourth columns lis
plug/jack reference designators.

Refer to table 2-5 and list the informat
in the four columns.

a. First Column - _____

b. Second Column - _____

c. Third and Fourth Columns - _____

_____.

or.

and test cables table.

ck
e
ors.

- a. Cable reference designator.
- b. Major unit reference designators.
- c. Part number for each cable.
- d. Test point reference designators.
- e. Plug/jack reference designators.

5. An Interconnection Diagram of the airborne search radar trainer depicts the relative position of the _____.

Reference designators identify the _____
_____ and _____/
_____ connectors.

Lines between the major units represent
_____ connected to the plug/
jack connectors of the major units.

major units,
plug/jack,

cables

figure 2-3, and the Interconnection and Test

Cables tables, 2-5 A and B.

The cable numbers shown on the tables correspond to the numbers printed on the cables. The technician should refer to the plug/jack reference designator column for each cable to be checked or connected. The cables connected between major units must be connected as shown; otherwise the radar system will be inoperative or possibly damaged.

The following problems are provided to give you a working knowledge of the Interconnection and Test Cable Table 2-5.

- a. The reference designators for the plug/jack connectors for W7 are _____ and _____
- b. The cable reference designator for the cable connected between A7J3 and A8J4 is _____
- c. Which units is W9 connected between? (Give unit reference designators) _____

a. A3J1, A4J1

b. W18

c. A6, A3

7. Which cable is connected between A1J3 and A2J3? Refer to the Interconnection and Test Cable Table 2-5. _____

interconnection of the wires or cables between major units/assemblies is the interconnection and test cables table.

Which data listed below are shown on table

2-5 A and B in the airborne search radar MIM? (circle three).

- a. Test point reference designators.
- b. Part numbers for major units.
- c. Part numbers for the cables.
- d. Plug/jack reference designators.
- e. Test equipment connections.
- f. Cable reference designators.

9. Select three items below, shown on the interconnection diagram, figure 2-3, provided in the airborne search radar system trainer.

- a. An illustration that depicts the physical location of the major units.
- b. Wire designators.
- c. Cable designators.
- d. Reference designators for the major units and plug/jack connectors.
- e. Lines that represent wires or cables.

interconnecting wiring diagrams located in section V of the MIM. You will be using the airborne search radar interconnecting wiring diagram to identify signals and voltages coupled between major unit/assemblies.

You are not expected to memorize any of the signals or voltages on the wiring diagrams. Instead, you will use the diagrams to determine the signals or voltages on wires or cables identified by a reference designator.

The experience you gain in the use of interconnecting diagrams is directly related to the job tasks you may perform on an aircraft or in the work center.

NO RESPONSE REQUIRED

10. Wiring diagrams are used to depict power distribution, control paths, and signal paths between or within major units. This discussion will explain the interconnecting wiring diagrams between major units/assemblies of the airborne search radar trainer. To effectively utilize wiring diagrams, a technician must interpret the information represented.

The major units are represented by blocks that form a block. In:

nomenclature for the major unit. Outside and directly above each block is the reference designator for the major unit. The part number for the major unit is sometimes shown.

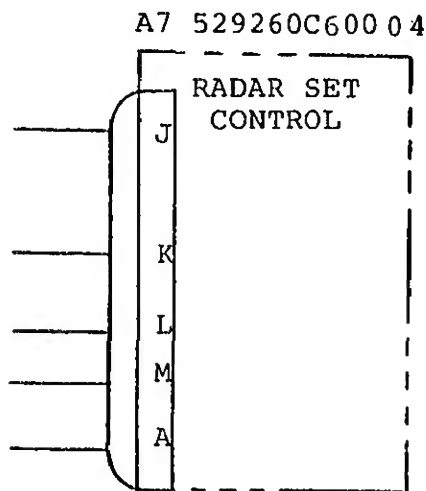
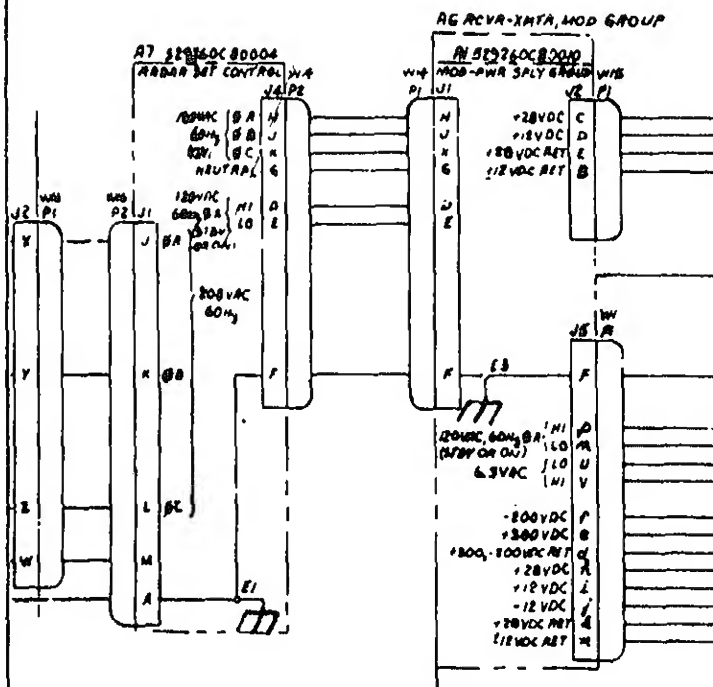


Figure 1

In figure 1, the nomenclature for the major unit is: RADAR SET CONTROL. The reference designator is A7 and the part number is 529260C60004. The interconnecting cables between the major units are assigned a reference designator. In figure 2 on the next page there are four interconnecting cables W1, W14, W15, and W16. Cable W1 is connected between J5/P1 of the A6A1 assembly and P2/J2 of the A6A2 assembly. Cable W15 is connected between J2/P1 of the A6 unit P2/J5 of the A7 unit.

For each plug/jack connector, the "P" represents

the plug and the "J" represents the jack. The plug is normally part of the cable assembly and the jack is normally part of the unit assembly. Each plug/jack connector has a set of male and female pin connectors. Each pin has an associated letter or number. The letters may be upper or lower case. The data coupled through each pin is identified next to each respective pin on the jack of the source unit/assembly.



10. (Continued)

Refer to the Airborne Search Radar Interconnecting Diagram, figure 5-3, sheet 1 of 3, in the maintenance instruction manual and answer the following questions.

- a. What is the primary power input cable reference designator? _____.
- b. What is the primary input power to the cabinet? _____.
- c. Locate W18 on figure 5-3, sheet 1 of 3 and list the reference designator for the major units and the plug/jack connectors W18 is attached to. _____, _____, _____ / _____, and _____ / _____.

11. Refer to figure 5-3, sheets 1, 2, and 3, in the Airborne Search Radar Trainer Interconnecting Diagram. Match the reference designators in column A to the appropriate signals and voltages in column B.

Column A

Column B

- | | |
|------------------------|--------------------------|
| a. W7P2-h to W7P1-h. | (1) 1kHz CLOCK. |
| b. W8P1 to W8P2. | (2) 26 VAC 400 Hz (H1). |
| c. W18P1-D to W18P2-D. | (3) 10 MILE CONT. (VOLT- |

b. (1)

cable table. Which cable is connected between

c. (4)

A1J3 and A3J5? (Circle one).

a. W7.

b. W5.

c. Q2.

d. W3.

d.

13. Refer to the list below and circle three items shown on the interconnection and test cable tables 2-5A and 2-5B in the airborne search radar trainer MIM.

a. Test point reference designators.

b. Cable reference designators.

c. Test equipment connections.

d. Plug/jack reference designators.

e. Part number of cables.

f. Part number of major units.

Airborne Search Radar Interconnecting Diagram.

Match the designators in column A to the appropriate signals and voltages in column B.

Column A

Column B

- a. W13P2-T to W13P1-T. (1) -200 VDC.
- b. W11P2 to W11P1. (2) RF.
- c. W1P1-f to W1P2-f. (3) +28 VDC.
- (4) TILT ERROR SIG (LO).
- (5) VIDEO.

15. Refer to the 15A21 MIM interconnection and test cable table. Which cable is connected between PS1J1 and A8J1?

- a. W20
- b. W19
- c. W18
- d. W14

16. Refer to figure 5-3, sheets 1, 2, and 3, Airborne Search Radar Interconnecting Wiring Diagrams. Match the designators in column A to the appropriate voltages in column B.

Column AColumn B

- a. W15P1-N to W15P2-N. (1) NEG. SWEEP GATE.
- b. W7P1-s to W7P2-s. (2) PITCH SIG (LO).
- c. W7P1-i to W7P2-i. (3) -12 vdc.
- (4) ± 23 vdc gnd.
- (5) STC DEPTH.

- a. (5)
- b. (3)
- c. (1)

At this point, you may take the lesson topic progress check. You may find it beneficial to review the objectives for this lesson topic. If you answer all self-test items correctly, go on to the next lesson topic. If not, select and use another medium of instruction, narrative, or consultation with the lead supervisor, until you can answer all self-test items on the progress check correctly (achieve lesson topic learning objectives) and then proceed to the next lesson topic.

AVIONICS TECHNICIAN COURSE, CLASS A1

UNIT 5

MODULE 1

LESSON TOPIC 4A

LLATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS, PART 1
NAME PLATE DATA

LESSON TOPIC 5-1-4A

INSTALLATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS, PART 1 NAME PLATE DATA

As an avionics technician you will be responsible for the maintenance of various avionics systems associated with aircraft in your activity. This lesson topic will explain the Joint Electronics Type Designation System and how it relates to the identification of an avionics system. A thorough understanding of the material in this lesson will enable you to locate units in an avionics system with little difficulty.

The objectives for this lesson topic are as follows:

From a list of statements, select the statement that describes the purpose of the Joint Electronics Type Designation System (JETDS).

From a list the designation for a system.

From a list the information provided by the second letter of the equipment indicator.

From a list the designation for a unit.

From a list of unit indicators, select the unit indicator for a receiver-transmitter and an antenna.

The objectives in this lesson topic must be accomplished with 100 percent accuracy, unless otherwise stated.

Beginning this lesson topic, carefully review the "List of Learning Resources". Keep in mind that your learning supervisor can be a valuable learning resource. Always feel free to consult your supervisor if you have problems or questions.

INSTALLATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS, PART 1
NAME PLATE DATA

To learn the material in this lesson topic, you may choose, according to your experience and preferences, any or all of the following written lesson topic presentations.

WRITTEN LESSON TOPIC PRESENTATIONS IN MODULE BOOKLET:

1. Lesson topic summary.
2. Programmed instruction form of lesson topic.
3. Narrative form of lesson topic.
4. Lesson topic progress check.

ENRICHMENT MATERIALS (topic references):

1. Audio visual materials (as applicable)
2. MIL-STD 196C Military standard, "Joint Electronics Type Designation System (JETDS).

All the resources listed above are available and may be used as you see fit. Your learning supervisor represents a most valuable learning resource. Use him when you need help. It is not necessary to use all the resources to achieve the learning objectives for the lesson topic. The lesson topic progress check is your means of determining when you have achieved the objectives. The progress check may be taken at any time and is graded by you. If you fail to achieve any objective at the lesson topic level, you will plan and accomplish your own remediation. If you need help in remediation planning, consult your learning supervisor.

LESSON TOPIC SUMMARY

INSTALLATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS, PART 1, NAME PLATE DATA

Avionics Type Designation System (JETDS) is the method used for identifying specific electronic systems, units, or major assemblies through the use of name plates and identification plates. Each assembly or module of a system or set has a name plate attached

as an example of a name plate for a complete system. The prefix reference designations for complete systems. The three letter (as the example) is known as the equipment indicators which Installation, type and purpose of the system. These designations are found on the JETDS chart (figure 2) under the heading: Table of Equipment Indicators.

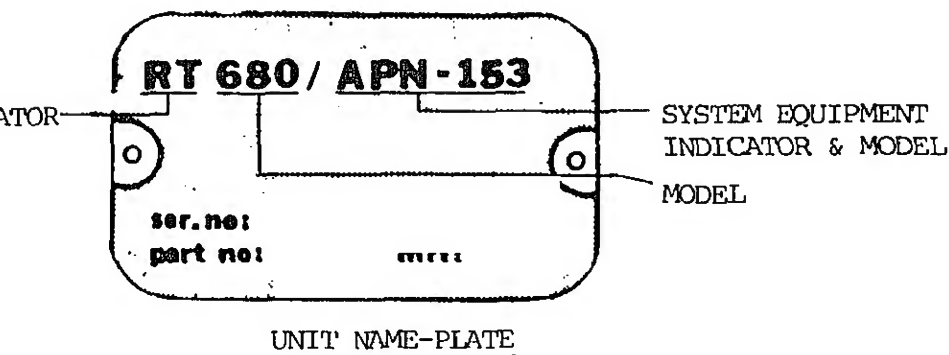
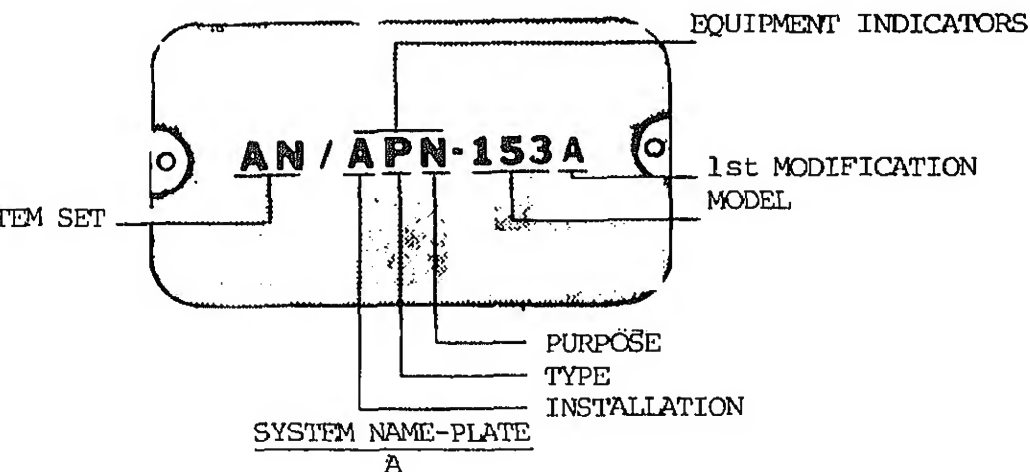


Figure 1

letters which represents the purpose/function. These designations are listed in the table of Unit Indicators on the JETDS chart. The grade number represents the model (680 in the example). The grade to the right of the slant sign is the equipment indicator and model number the unit belongs.

At this point, you may take the Lesson Topic Progress Check. If you answer all self-test items correctly, go on to the next Lesson Topic. If you do not, select and use another medium of instruction for the Lesson Topic: Programmed Instruction, Narrative, or consultation with Learning Objectives until you can answer all self-test items on the Progress Check. Once you have achieved Lesson Topic Learning Objectives, then proceed to the next Lesson Topic.

merous electronic systems installed in each naval aircraft. The electronic system is made up of major units or assemblies (commonly called BLACK BOXES) which can be replaced. Technicians must have a good understanding of how to determine the system that each major unit belongs to so proper identification can be entered into the maintenance action forms.

The Electronics Type Designation System (JETDS) formerly known as the Jetstream system is used by each branch of the service for identifying electronic systems, units, or material through the use of name plate identification plates.

The part provided at the end of this lesson topic consists of three questions which can be used to determine what each designator on a name plate

represents. The designators that are used to identify a complete system, are normally the designators for the assembly that comprises the bulk of the system. Actually a system includes all major units or assemblies (black boxes), mounting racks, and other components such as: relays, antennas, waveguides, shields etc. The name plate for a complete system is designated by an "AN" designator such as shown in figure 1.

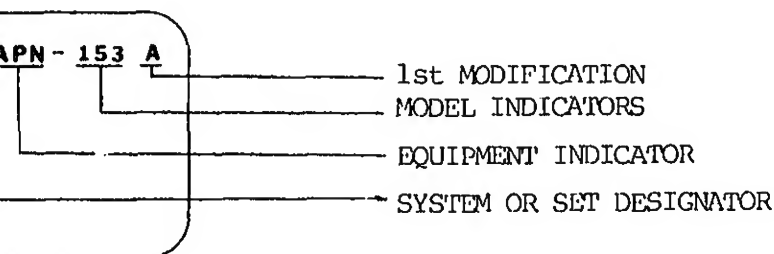


FIGURE 1

The equipment indicator is always a part of a system designator which contains the letters as shown in figure 1. Figure 2 provides a further breakdown of the equipment indicator.

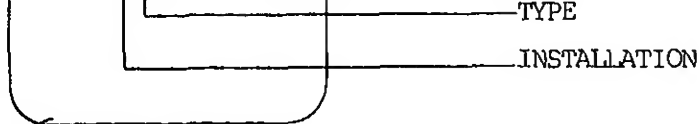
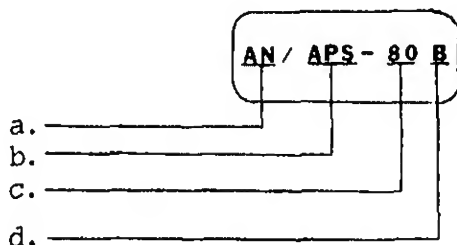


Figure 2

The first letter in the equipment indicator represents where the system is installed.

The Table of Equipment Indicators on the JETDS chart lists all applicable INSTALLATION codes. In the example installation designator, shown in figures 1 and 2, the letter "A" represents PILOTED AIRCRAFT. The TY designator (letter P in figures 1 and 2) represents Radar. The last letter in the equipment indicator represents the PURPOSE of the system, N represents navigation.

Each system built by a specific manufacturer for the military is numbered in sequence. The model number 153 is the 153rd model built for the military by this specific manufacturer. If a major modification is made to a system, it is assigned a letter designator to represent the modification as follows: A is 1st, B is 2nd, C is 3rd, etc., Refer to the JETDS chart and list the correct information for each designator on the following name plate.



-
- a. system or set b. equipment indicator
c. model indicator d. 2nd modification
-

ferred to as black boxes which includes control boxes, receiver-transmitter units and many others. Other information found on a name plate is the manufacturers code, serial number

of letters, as shown in figure 3 is the unit indicator. A designation is given on the JETDS chart. In the example name plate it represents a receiver-transmitter unit.

Figure 3; 680 represents the 680th model. The APN-153A is the equipment indicator and system model and modification designator.

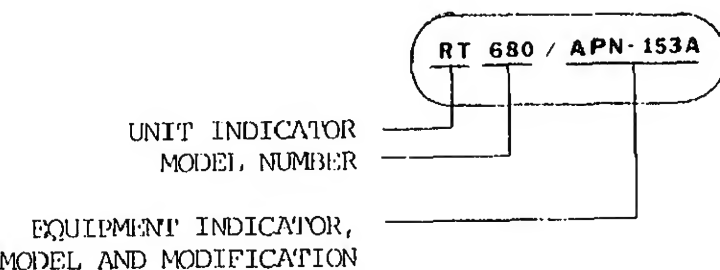
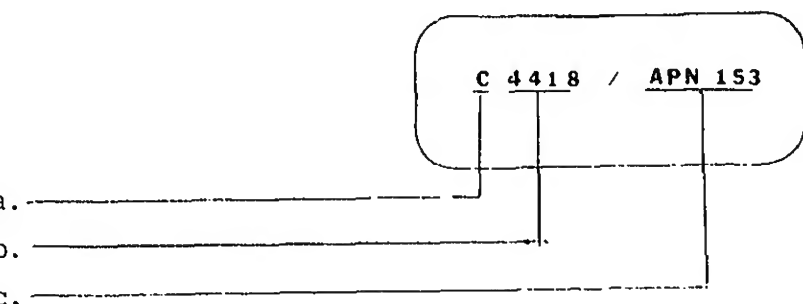


Figure 3

The plate illustrated below and label each designator as shown on the JETDS chart.



b. model

c. equipment indicator and model

If not, select and use another medium of instruction for the Lesson Topic: Programmed Instruction, Summary, or consultation with Learning Supervisor, until you can answer all self-test items on the Progress Check correctly (achieve Lesson Topic Learning Objectives) and then proceed to the next Lesson Topic.

INSTALLATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS, PART 1

NAME PLATE DATA

INTRODUCTION

Electronics Type Designation System (JETDS), formerly known as "N" nomenclature system, and its procedures are mandatory for identifying all electronics equipment used by the combined Armed Forces. The system is designed so that its indicators will tell at a glance many things pertinent to the item or equipment. For example, whether the item is a complete set or a component, and information such as where it is used, the kind of equipment, and its function. When speaking of name plate data, reference should be made to JETDS, and its associated procedures and format.

The Electronics Type Designation System (JETDS) is very useful in explaining the data normally found on name plates on electronic equipment. Before explaining the name plate data and its associated designators (numbers, letters, etc.), let's first review JETDS.

of identification of specific electronics systems, units, or material through the use of name plates and identification plates without the use of the FAMILY-NAME portion of the nomenclature. Refer to figure 1(A). Here you can see that if this nameplate were attached to a specific unit, it would be quite large, and would require a sizable mounting area, due to the fact that the entire name is used on the name-plate.

(A)

AIRBORNE SEARCH RADAR SYSTEM
RECEIVER - TRANSMITTER

(B)

RT680/APS-80

FIGURE 1: EQUIPMENT NAMEPLATES

Whereas, in figure 1(B), the noun-name portion is replaced by the letters/numbers that identify the receiver-transmitter (RT) as specified by the JETDS.

The purpose of the JETDS is to provide a means of identification of specific _____

name plates and identification plates.

2. TRUE/FALSE (circle one) The purpose of the JETDS is to provide a means of identification of mechanical and electronic systems, units, or material through the use of name plates or identification plates.

3. Although the JETDS is used for the identification of all electronic systems, you will only be concerned with its application to avionics systems. The system was formerly referred to as the "AN" system because system and unit designators were prefixed with the letters "AN." The "AN" designation is still assigned to systems, but units do not retain the "AN" title.

To correctly understand the JETDS format and how the letters are assigned to the systems and units, refer to the JETDS chart.

The chart shows the three basic areas into which the JETDS is broken down. Refer to the example name plate shown in figure 2. This is a name plate that is used to represent an avionics system. The indicator for the complete system (or set)

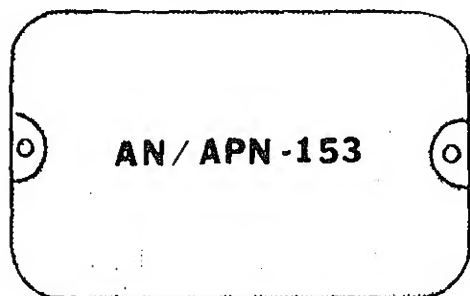


Figure 2: System Designator

begins with the letter "AN." This is followed by a slash and a three letter group. The three letters of the second group give the general name of the installation, the type of equipment, and the purpose of the equipment, respectively. Following the three letter group is a number which indicates the specific model of the equipment. Thus, the example name plate in figure 2 would describe an airborne radar navigational system.

3. (Continued)

Which of the following would be a designation for a system? (Circle one)

- a. MX 3186/ASA-16.
- b. PP 3102/APS-80.
- c. AN/APN-52.

4. TRUE/FALSE The system designation AN/APS-80 (Circle one) represents an airborne search radar system, model 80.

5. The purpose of the Joint Electronics Type Designation System (JETDS) is to (Circle one)

- a. Provide a means of identification of specific electronic systems, units, or material through the use of name plates and identification plates without the use of the FAMILY-NAME portion of the nomenclature.
- b. Provide for easy identification of electronic items that are not commonly found in the FSN catalog.
- c. Provide for easy identification and positive control of classified electronic material.
- d. Serve as a tool for easy location of electronic items that are necessary to maintenance but that are not commonly supplied to the fleet by individual manufacturers.

cribes the TYPE of equipment. A P for the second letter would indicate radar. An R would be used for radio, an L would indicate counter-measure equipment.

The second letter of the equipment indicator in the system designator AN/APS-80 tells the technician that the system is of the _____ type.

radar

7. In a system, or set indicator, the second letter of the second group describes the _____ of equipment being used.

type

8. Which of the following is a designator for a system? (Circle one).
- a. R648/AIC 32.
 - b. PP3102/APS-80.
 - c. RT384/APX-72.
 - d. AN/APN 152(V).

System (JETDS) is to:

- a. Provide a means of identification of specific electronic systems, units, or material through the use of name plates and identification plates without the use of the FAMILY-NAME portion of the nomenclature.
 - b. Provide for easy identification of electronic items that are not commonly found in the FSN catalog.
 - c. Provide for easy identification and positive control of classified electronic material.
 - d. Serve as a tool for easy location of electronic items that are necessary to maintenance but are not commonly supplied to the fleet by individual manufacturers.
10. When an avionics system contains two or more units the name plates on the individual units may resemble the following example (refer to figure 3).

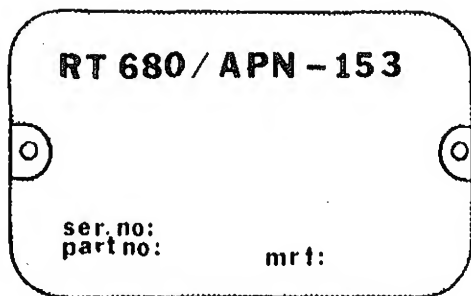


Figure 3: Unit Designator

The equipment indicator is retained on the nameplate and a unit indicator is added to describe the type of unit being used with the system. Refer to the JETDS summary chart. The table of unit indicators lists the letters "RT" as signifying a receiver-transmitter unit. The numbers "680" denotes the model number of the RT unit. The lower portion of the name plate is reserved for more specific information on the unit, such as the serial numbers, part number, and manufacturer's code for that particular unit.

TRUE/FALSE. The unit and equipment indicator (Circle one)

RT384/ARN 52 is used on a name plate to identify a receiver-transmitter unit in an airborne radio navigational system.

TRUE

11. Which of the following is a unit indicator?
- a. AN/APS-88(V).
 - b. OA3694/ASA-16.
 - c. AN/APN 122(V).
 - d. RT 680/APN 153 (V).

bes the (circle one)

- a. purpose of the equipment.
- b. type of equipment.
- c. method of installation.
- d. equipment classification.

13. Which of the following is a designation for a system?

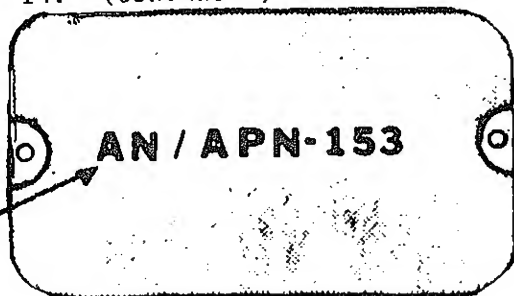
- a. MX 3183/ASA-16.
- b. AN/APS-88.
- c. PP 3102/APS-80.
- d. RT 384/APX-72.
- e. R40/VRC-12.

14. When multiple units are associated with the same system, such as shown in figure 4, each unit has its own unit indicator. In this particular example, the system is made up of three units, these being the receiver-transmitter (RT), the antenna (AS), and the control box (C). Notice that the equipment indicator is the same for all three units, because they are part of the APN-153 system. The JETDS summary chart lists the unit indicators assigned for all electronic equipment including MISCELLANEOUS IDENTIFICATIONS THAT MAY BE A PART OF A TYPE

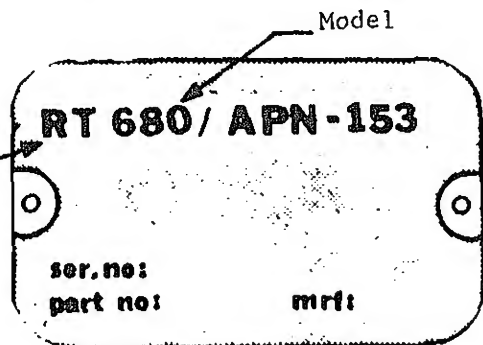
DESIGNATION. (Refer to the miscellaneous identification in the JETDS chart.)

The unit indicator for a receiver-transmitter

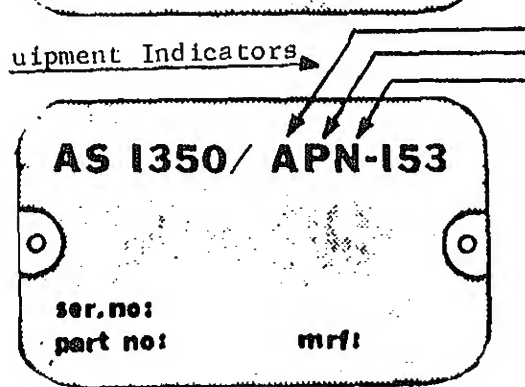
14. (Continued)



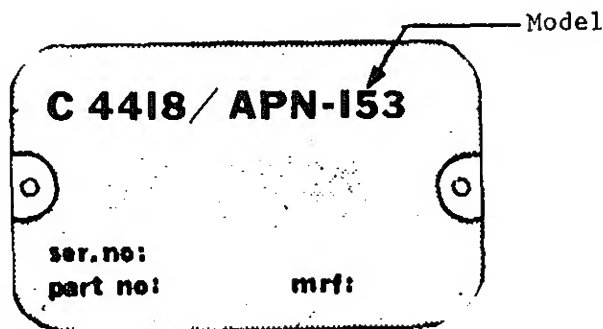
SYSTEM NAME-PLATE



UNIT NAME-PLATE



Installation
Type
Purpose



an antenna and a receiver-transmitter? (circle one)

- a. AS; RT.
- b. AT; RS.
- c. AR; ST.
- d. LS; AT.
- e. SA; RT.

16. Circle the correct unit indicator for a computer.

- a. CU.
- b. MP.
- c. CT.
- d. CP.
- e. CW.

17. The second letter of an equipment indicator describes the:

- a. Method of installation.
- b. Purpose of the equipment.
- c. Classification of the equipment.
- d. Type of equipment.

RT.

The unit indicator for an antenna is _____.

19. Which of the following is a designation for a unit?

- a. RT 384/ARN 56N.
- b. OA-286/A1C-22.
- c. AN/APS-80.
- d. AN/APN-153.

20. What is the unit indicator for a receiver-transmitter and an antenna?

- a. PU; RT.
- b. RL; SA.
- c. RT; AS.
- d. BS; ST.

At this point, you may take the lesson topic progress check. You may find it beneficial to review the objectives for this lesson topic. If you answer all self-test items correctly, go on to the next lesson topic. If not, select and use another medium of instruction, narrative, or consultation with the learning supervisor, until you can answer all self-test items on the progress check correctly (achieve lesson topic learning objectives) and then proceed to the next lesson topic.

AVIONICS TECHNICIAN COURSE, CLASS A1

UNIT 5

MODULE 1

LESSON TOPIC 4 B

INSTALLATION AND INSPECTION OF AIRCRAFT AVIONICS
SYSTEMS, PART 2

ATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS, PART 2

s are considered to be the heart of any preventative maintenance. Minor discrepancies are detected and corrected before they have a chance to develop into major, time-consuming discrepancies.

liability and life of the equipment is improved due to the use of this system as well as the continuation of safety for the pilot, crew, and the aircraft.

Completion of this lesson you will be able to:

1. list, select the purpose for performing an inspection on an avionics system.

2. list, select the reference technicians use to perform inspections.

3. list, select the discrepancies technicians look for while performing visual inspections.

4. list, select the type(s) of inspections performed on an avionics system.

Unless otherwise stated in the learning objective, all objectives for this lesson topic are to be completed to 100% accuracy.

Beginning this lesson topic, carefully review the "List of Resources" provided. Keep in mind that your learning supervisor is your most valuable learning resource. Always feel free to contact him if you have problems or questions.

INSTALLATION AND INSPECTION OF AIRCRAFT AVIONICS SYSTEMS

To learn the material in this lesson topic, you may choose, according to your experience and preferences, any of the following written lesson topic presentations.

WRITTEN LESSON TOPIC PRESENTATIONS IN MODULE BOOKLET

1. Lesson topic summary.
2. Programmed instruction form of lesson topic.
3. Narrative form of lesson topic.
4. Lesson topic progress check.

ADDITIONAL MATERIALS REQUIRED FOR SUCCESSFUL COMPLETION OF LESSON TOPIC

1. Job program in Job Program Booklet.
2. Student response sheets.
 - a. Job data sheet.
 - b. Answer sheet for use with test.
 - c. Programmed instruction response sheets.

ENRICHMENT MATERIALS:

1. Aviation Fire Control Technician 3 & 2, NAVPER 10-11.1, Chapter 18.
2. Maintenance Instruction Manual, 15A21 Radar Transmitter (Organizational Maintenance Section).

All the resources listed above are available and may be used as you see fit. Your learning supervisor represents the most available learning resource. Use him when you need help. It is necessary to use all the resources to achieve the objectives for the lesson topic. The lesson topic progress check is your means of determining when you have achieved the objectives. The progress check may be taken at any time and graded by you. If you fail to achieve any objective at the lesson topic level, you will plan and accomplish your remediation. If you need help in remediation planning, consult your learning supervisor.

f performing an inspection can be divided into two broad areas. Determine or verify the material conditions of the system. The determine or verify the operational status of the system.

that technicians use to perform inspections is the Main-
uction Manual (MIM). While performing a visual inspection,
n looks for three major types of discrepancies. One is any
cal defects. The second is the equipment security. The
s the security of attached parts.

tions described in the MIM, there are three inspections of
est to the organizational maintenance technician. They are:
pection.

Inspection.
t Inspection.

, you may take the Lesson Topic Progress Check. If you
lf-test items correctly, go on to the next Lesson Topic.
t and use another medium of instruction for the Lesson Topic:
struction, Narrative, or consultation with Learning Super-
you can answer all self-test items on the Progress Check
hieve Lesson Topic Learning Objectives) and then proceed to
on Topic.

inspections are considered to be the heart of any preventive maintenance program. Through inspections, minor discrepancies are corrected before they develop into major time-consuming discrepancies. Also, the system reliability and service life are improved, thus maintaining the safety of the pilot, crew, and aircraft.

The primary purpose of any inspection is to determine or verify the material condition and operational status of the system being inspected. The following example, a true case history, will give you insight into the importance of aircraft inspections.

A-3 aircraft was suddenly assigned to fly the mission of another aircraft. Although the assigned aircraft was considered to be in a ready status, it in fact was not. Technicians had removed equipment to facilitate maintenance on other aircraft and had placed equipment received to replace it in the aircraft without securing it.

One-half hour before flight, a technician decided to make a final operational check of the radar. In the cockpit, he noticed the control box had not been secured to the panel. After securing the control box, he decided to inspect all of the equipment in the system. The technician found several discrepancies, some of which could have done extensive damage to the aircraft, to say nothing of possible injury to the pilot and crew.

One item, weighing 30 pounds, located in the nose of the aircraft, could have smashed through the radome as the aircraft landed on the carrier deck. Another item, weighing in excess of 50 pounds, located in the tail section, could have done damage to other equipment in the tail.

The technician quickly remedied these and other minor discrepancies by properly securing them. Eight bolts and a length of safety wire were required, aside from a screwdriver for other securing. If the technician had not responded and if the aircraft had been launched, the discrepancies could have been far worse. These discrepancies might have included the necessity for a new radome, equipment, pressure lines, wiring connections of waveguide, and new mounting racks, just to name a few. It would also be the paperwork required to replace all the aforementioned items, plus the paperwork required to explain why it happened.

The technician was able to determine or verify the material condition of the system and the operational status by performing an inspection of the aircraft's radar system.

operational

organizational and intermediate maintenance use the MIM specifies the type of inspection, depth of the inspection, and of the inspection. This information is contained in sections the MIM. Section III covers the procedures for inspections the organizational maintenance level. When an inspection assembly of a major unit, the procedures are specified in section MIM. In the operating squadrons, these same inspections are Maintenance Requirement Cards (MRC). These cards break the down into steps to ensure that all areas are inspected with looked. Since aircraft are subjected to a variety of stresses, vibrations, and environments, if they are not inspected regularly the aircraft would soon be inoperable. The correction of deficiencies and the timely lubrication performed in compliance with section requirements, improves the reliability of the aircraft safety for the crew. This can be seen from the preceding A-3 aircraft.

During an inspection, the technician should refer to the:
Maintenance Control Register.
Maintenance Instruction Manual.
Maintenance Parts Breakdown.
Block Diagram of the System.

discrepancies found while performing visual inspections are three basic categories: (1) PHYSICAL DEFECTS; (2) EQUIPMENT MOUNTING, and (3) SECURITY OF ATTACHED PARTS.

are normally sequenced with specific checks to be performed. normally include looking for physical defects, security of the security of attached parts.

When a technician inspects each piece of equipment, he looks for obvious DEFECTS. These defects include major damage (dents) caused by falling, broken or clogged air screens, broken or missing dials, knobs.

important item to check for during a security inspection is the proper installation of safety wire because vibrations can cause parts to work loose, which in turn could cause severe damage to the aircraft.

During the inspection, the SECURITY of ATTACHED PARTS requires that cable pressure lines, hydraulic lines, waveguides, etc. are examined to ensure that they are correctly connected to the equipment. If these parts are not correctly attached to the equipment, bulkhead, frame or rack, the possibility of interference with other systems, such as flight control cables, is increased and can result in possible damage or loss of the aircraft.

What discrepancies should a technician look for while performing a visual inspection of avionics equipment?

- Electrical correctness.
- Equipment security.
- Antenna reception.
- Physical defects.
- Security of attached parts.

d,

e

There are three inspections of primary interest to the organizational maintenance technician. They are:

- DAILY INSPECTIONS,
- PREFLIGHT INSPECTIONS,
- POSTFLIGHT INSPECTIONS.

DAILY INSPECTION is performed between the last flight of the day and the next flight, if no more than 72 hours have elapsed between the inspection and the next flight. This inspection is a combination of requirements for the checking of equipment, requiring a daily verification of satisfactory function, plus requirements that prescribe the searching for and correcting of relatively minor problems to prevent their progressing to a state requiring major repair.

PREFLIGHT INSPECTION is performed prior to each flight and consists of checking the aircraft for flight readiness by performing visual checks and operational checks to determine that there are no defects or maladjustments that could cause deficient operation of systems resulting in abnormalities or accidents.

tailing aircraft safety devices, and proper security of the
for the last flight.

an performs many types of inspections on avionics equipment.
of inspections are _____, _____
_____, and _____.

ions, preflight inspections, post flight inspections (any order)

_____, you may take the Lesson Topic Progress Check. If you
self-test items correctly, go on to the next Lesson Topic. If
and use another medium of instruction for the Lesson Topic:
instruction, Summary, or consultation with Learning Supervisor,
answer all self-test items on the Progress Check correctly
(on Topic Learning Objectives) and then proceed to the next

1. Operating aircraft are subjected to a variety of stresses, strains, vibrations, environments. If it were not inspected regularly for defects, the aircraft would become inoperable. The correction of discrepancies, in conjunction with inspection, enables the aircraft to be flown safely mission to mission.

The purpose of performing an inspection can be divided into two broad areas. One is to determine or verify the material condition of the system. The second is to determine or verify the operational status of the system.

The material condition refers to the completeness of the system with respect to equipment. That is, does the system have all the equipment that it is supposed to have? Also, the material condition refers to the security of the equipment and its attached parts.

capabilities of the system. How well does the system operate? Does the system operate as well as it should?

These and other questions are answered by performing an operational inspection on the system, which is one of many types of inspections dealing with the material condition of the system.

The primary reason for performing an inspection on an avionics system is to determine or verify the _____ condition and the _____ status of the system.

-
2. The primary reason for performing an inspection on an avionics system is to:
- a. determine or verify the operational status of the system.
 - b. determine or verify the reliability of the system.
 - c. determine or verify the material condition of the system.
 - d. both a & c are correct.
 - e. both b & c are correct.

(MIM).

The MIM describes the various types of inspection to be performed on the system. The technician must use Maintenance Requirement Cards in the performance of the inspection. These cards break the inspection down into steps to ensure that the inspection is complete in all areas with nothing overlooked. This lesson emphasizes the use of the MIM as a guide for the inspection.

What publication should the technician use to obtain information concerning various inspections performed on avionics systems? _____

Maintenance
Instruction
Manual

4. Before beginning an inspection, the technician should refer to the:
 - a. Maintenance Control Register.
 - b. Maintenance Instruction Manual.
 - c. Illustrated Parts Breakdown.
 - d. Detail Block Diagram of the System.

- a. determine or verify the operational status of the system.
- b. determine or verify the material condition of the system.
- c. determine or verify the reliability of the system.
- d. both a & b are correct.
- e. both b & c are correct.

6. In checking the material condition of an avionics system, the technician is performing a visual inspection of that system. Normally this is accomplished with no power applied to the system, reducing the shock hazard.

During the inspection, the technician is looking for three major types of discrepancies. One is any obvious physical defects. This implies damage to any piece of equipment, broken cables, waveguides, etc. The second is the equipment security. Fasteners should be employed correctly to ensure that the equipment stays put. The third involves the security of attached parts. Waveguides, cables, air pressure lines, and hydraulic lines, etc., need to be secured to the bulkhead or other areas of the aircraft exactly as designated by the manufacturer.

List the three major types of discrepancies.

technician looks for in checking the material condition of an avionics system.

a. _____.

b. _____.

c. _____.

- a. Physical defects.
- b. Equipment security.
- c. Security of attached parts.

7. Which discrepancies should a technician look for while performing a visual inspection of avionics equipment?

- a. Electrical correctness.
- b. Antenna reception.
- c. Security of attached parts.
- d. Equipment security.
- e. Physical defects.

- c,
- d,
- e.

8. There are various types of inspections made on aircraft systems. Prior to beginning an inspection, the technician should consult the _____ for that system.

on an avionics system is to:

- a. determine or verify the material condition of the system.
 - b. determine or verify the operational status of the system.
 - c. determine or verify the reliability of the system.
 - d. both b and c are correct.
 - e. both a and b are correct.
-

10. Of the inspections described in the MIM, there are three inspections of primary interest to the organizational maintenance technician. They are:
- (1) Daily Inspection, (2) Preflight Inspection, and (3) Postflight Inspection.

The daily inspection is performed between the last flight of the day and the next scheduled flight, if no more than 72 hours have elapsed between the last inspection and the next scheduled flight. Should this elapsed time exceed 72 hours, another daily inspection is performed.

The preflight inspection is performed prior to each flight. This inspection consists of checking the system visually and operationally.

The postflight inspection is similar to the preflight inspection except, as its name implies, it is performed immediately after the flight. Three types of inspections performed on an avionics system are:

- a. _____.
- b. _____.
- c. _____.

- a. daily inspection
- b. preflight inspection
- c. postflight inspection

11. The type(s) of inspection performed on avionics systems is/are:
- a. Daily.
 - b. Preflight.
 - c. Postflight.
 - d. All of the above.

d.

12. Equipment needs to be checked to ensure that it is securely fastened to the mounting rack. Not only is the safety of the aircraft and its crew at stake, but also there are some racks that have electrical connections built into them and make contact with the equipment when the equipment is properly secured to the rack. Improper securing can cause physical damage, as well as electrical damage within the system.

while performing a visual inspection on avionics equipment?

- a. Physical defects.
- b. Antenna reception.
- c. Electrical correctness.
- d. Equipment security.
- e. Security of attached parts.

13. Before beginning an inspection, the technician should refer to the:

- a. Maintenance Control Register.
- b. Illustrated Parts Breakdown.
- c. Maintenance Instruction Manual.
- d. Detailed Block Diagram of the System.

14. The technician performs many types of inspections on avionics systems. Three types of inspections

are _____,

_____, and

_____.

P.I.

daily
inspection,
preflight
inspection,
postflight
inspection.

(any order)

15. Which discrepancies should a technician look for while performing a visual inspection on aviation equipment?

- a. Electrical correctness.
- b. Security of attached parts.
- c. Equipment security.
- d. Antenna reception.
- e. Physical defects.

b,
c,
e.

16. The type(s) of inspection performed on aviation equipment system is/are:

- a. Postflight.
- b. Preflight.
- c. Daily.
- d. All of the above.

d.

NOTE: Read pages 2-1 through 2-32, paragraphs 3-8 through 3-15 and refer to Table 3a and 3b in the MIM.

At this point, you may take the lesson topic progress check. You may find it beneficial to review objectives for this lesson topic. If you answer self-test items correctly, go on to the next topic. If not, select and use another medium of instruction, narrative, or consultation with your learning supervisor, until you can answer all self-test items on the progress check correctly (achieve lesson topic learning objectives) and

AVIONICS TECHNICIAN SCHOOL, CLASS A1

UNIT 5

MODULE 1

LESSON TOPIC 5

REMOVING AND REPLACING LINE REPLACABLE UNITS

OVERVIEW

LESSON TOPIC 5-1-5

INSTALLING AND REPLACING LINE REPLACEABLE UNITS

In this lesson, you will learn procedures that are essential for the installation and removal of avionics units and great emphasis will be placed on the aspect of personnel and prevention of damage to the aircraft and its equipment.

Objectives for this lesson topic are as follows:

1. Select the section in the MIM that provides the information needed to locate the major units in the search radar trainer, 15A21.

2. Select the section of the MIM that includes the procedures for the removal/installation of major units.

3. Select the statement describing the primary safety precautions for observing safety precautions.

4. Select the purpose of tagging unidentified units.

5. Select the purpose of visually checking a major unit.

6. Select the purpose of accounting for all safety wire when working on an avionics system.

7. Select the purpose of ensuring that major units are properly installed in aircraft.

Objectives in this lesson topic must be accomplished 100 percent accuracy, unless otherwise stated.

During this lesson topic, carefully review the "List of Resources". Keep in mind that your learning supervisor is your most valuable learning resource. Always feel free to ask him if you have problems or questions.

REMOVING AND REPLACING LINE REPLACEABLE UNITS

To learn the material in this lesson topic, you may choose according to your experience and preferences, any or all the following written lesson topic presentations.

WRITTEN LESSON TOPIC PRESENTATIONS IN MODULE BOOKLET:

1. Lesson topic summary.
2. Programmed instruction form of lesson topic.
3. Narrative form of lesson topic.
4. Lesson topic progress check.

ADDITIONAL MATERIALS REQUIRED FOR SUCCESSFUL COMPLETION OF LESSON TOPIC:

1. Job program in the Job Program Booklet.
2. Student response sheets.
 - a. Job data sheet.
 - b. Answer sheet for use with test.
 - c. Programmed instruction response sheets.

ENRICHMENT MATERIALS:

1. Airborne Search Radar System Training Device (15A21) Maintenance Instruction Manual.

All the resources listed above are available and may be used as you see fit. Your learning supervisor represents a measurable learning resource. Use him when you need help. It is not necessary to use all the resources to achieve the lesson objectives for the lesson topic. The lesson topic progress check is your means of determining when you have achieved lesson objectives. The progress check may be taken at any time and is graded by you. If you fail to achieve any objective at the lesson topic level, you will plan and accomplish your own remediation. If you need help in remediation planning consult your learning supervisor.

LESSON TOPIC SUMMARY

REMOVING AND REPLACING LINE REPLACABLE UNITS

of the MIM for the 15A21 radar trainer contains an illustration of the 21 airborne search radar system that indicates the location of units in the system. The removal and installation procedures are section III of the MIM.

important to observe safety precautions. The primary reason for safety precautions is to prevent damage to equipment and injury el. When removing and installing major units in an avionics h unidentified cables, they should be tagged to ensure proper tion of the cable or cables.

ing a major unit from an aircraft a technician visually checks d major unit for physical damages, bent or broken pins, and nnectors.

safety wire should be accounted for upon removal from equipment to prevent damages to the equipment and aircraft or injury to

e for properly installing and securing avionics equipment and raft equipment is to help prevent damage to the aircraft and and injury to personnel.

int, you may take the Lesson Topic Progress Check. If you self-test items correctly, go on to the next Lesson Topic. If t and use another medium of instruction for the Lesson Topic: Instruction, Narrative, or consultation with Learning Super- il you can answer all self-test items on the Progress Check (achieve Lesson Topic Learning Objectives) and then proceed t Lesson Topic.

the organizational maintenance performed on naval aircraft and avionics systems involves the removal or installation of units referred to as rack boxes. As with any maintenance tasks, there are step-by-step procedures along with numerous safety precautions that must be followed before, during, and after the removal or replacement of major units/assemblies.

The technicians first step in the removal or installation of a major unit is to check the MIM for the system and find where the unit is located. Section II of the MIM provides this information under the "Description of Major Assemblies." Section II also provides figures, tables, and paragraph descriptions for each major unit.

The location of a major unit is provided in section _____ of the MIM.

When the location of the unit has been determined, a further check with the MIM is required to find the step-by-step procedures. From the table of contents, the removal/replacement installation procedures are found in section III, paragraphs 3-45 through 3-57. The first part of the procedures, paragraph 3-46, describes some of the safety precautions to be followed during the procedures. After that, each major unit is listed and the correct procedures are given to remove and replace/install the unit properly.

Let's discuss the safety precautions and their function during maintenance on the avionics system. The safety precautions should be observed before and during the removal/installation of the major units to prevent damage to the equipment or injury to personnel. Failure to follow the precautions and procedures in the MIM can result in aircraft or equipment damage, more serious than that, short-cuts bypassing one or two steps could result in injury or death to you, the aircrewmembers or the ground-support people. When all of the safety precautions are observed, the number of accidents is reduced. However, if an accident occurs, due to metal fatigue, stress, etc., and all safety precautions were observed it is the fault of the maintenance personnel. With the high performance aircraft of today this type of accident accounts for only a very small percentage of the damage and injuries to personnel. Most of the damage to equipment and the injuries to personnel are caused by poor maintenance practices and failure to observe the safety precautions.

damage to equipment and injury to personnel

process of removing or installing the major units, the technician will be connecting or disconnecting the interconnecting cables. In the interconnecting cables will have the cable/plug numbers on them, in one of the following forms: engraved, stamped or metal tags. In some cases, however, the cable numbers have been lost or have been removed during the repair of the cable. In such cases, the technician should tag the cable to ensure proper identification of the cable when the unit is reinstalled. These untagged cables are the most time-consuming items for the technician. He must return to the work center for assistance, further information, or connect them to the wrong connector causing further damage to the system, or himself.

Tagged cables should be tagged to ensure _____
_____ or cables.

Installation

The first step after the major unit has been removed is to check it for physical damage; bent, shorted or broken pins and damaged connectors. A note on the MAF about the physical damage will help expedite repair of the unit. The note will inform the IMA technician to replace the damage prior to applying power to the unit which would prevent burning up of the test bench or further damage to the components of the unit.

A safety precaution to be strictly observed during the removal or installation of a major unit is that all pieces of safety wire must be secured. A piece of safety wire left on the flight line or deck, picked up by either propeller or jet blast becomes a projectile as deadly as a bullet fired from a gun. From your previous experience with safety wire you found out that the cut ends pierce the skin with relative ease causing personnel injury, but when the wire is attached to a moving engine, it could cause the engine to explode, sending parts outward just like a bomb.

During the installation of a major unit the technician must ensure it is installed correctly: all hold downs are tightened, mounts are attached and that safety wire is used at the key areas of stress and vibration. Due to the frequent removal and reinstallation of major units many different types of fasteners are used. Some of these types are:

- . Wing-nut fastener.
- . Bolts and nuts.
- . Screws.
- . Turnlock fastener.

The first two (2) fasteners are the most commonly used types and are required to be safety wired each time the unit is installed in the aircraft. Examples of this type of fastener are found in figure 2-3, Display Indicator, in the lower left and right corners.

The proper installation and securing of the major unit may not cause the system to work correctly but chances that it will come loose, causing damage to the aircraft, other equipment and personnel are minimized.

Select the reason a technician should properly install major units in the aircraft.

- . Give QA personnel time for other tasks.
- . Prevent electrical/electronic failures inflight.
- . Ensure the functioning of other equipment.
- . Prevent injury to personnel and damage to the equipment or aircraft.

At this point, you may take the Lesson Topic Progress Check. If you answer all self-test items correctly, go on to the next Lesson Topic. If not, select and use another medium of instruction for the Lesson Topic: Programmed Instruction, Narrative, or consultation with Learning Supervisor, until you can answer all self-test items on the Progress Check correctly (achieve Lesson Topic Learning Objectives) and then proceed to the next Lesson Topic.

REMOVING AND REPLACING LINE REPLACEABLE UNITS

INTRODUCTION

maintenance performed on naval aircraft and associated avionic systems involves the removal and installation of the so-called "black boxes."

In all maintenance tasks, there are step-by-step procedures as well as numerous safety precautions that must be observed before, during, and after removal or installation of major units/assemblies.

Failure to comply with the procedures that are provided in the maintenance instruction manual (MIM) for a particular system can result in damages to a system, an aircraft, or associated support equipment. More serious than equipment damage, short cuts around a step in maintenance procedures could cause injury or death to aircrewmen and ground-support personnel.

1. The technicians first step in preparation for work on a malfunction, in an avionics system that involves the removal or installation of a major unit is to check the maintenance instruction manual (MIM) for the system.

system that indicates the location of all major units in the system.

In the MIM for Device 15A21 an illustration indicates the location of all major units in the system can be found in Section _____.

II

2. Which section of the MIM provides information on the location of all major units in an airborne search radar system.
 - a. Section II.
 - b. section IV.
 - c. Section V.
 - d. Section I.
 - e. Section III.

a.

3. After determining the location of the unit to be removed or installed, turn to Section III for the removal/installation procedure. Follow the correct procedures in the main manual for the system and observance of a few minutes rest all provided in Section III, and then return to the radar system and maintain

Section _____ of the MIM.

4. Which section of the MIM gives the step-by-step procedures for removal/installation of major units in the airborne search radar system trainer.
- a. Section I.
 - b. Section II.
 - c. Section III.
 - d. Section IV.
 - e. Section V.

5. Section II of the 15A21 MIM contains an illustration which shows the location of all major units in the 15A21 airborne search radar system trainer.

Which section of the MIM provides information about the location of the various major units?

- a. Section I.
- b. Section IV.
- c. Section II.
- d. Section V.
- e. Section III.

c.

6. The primary reason for observing safety precautions is to prevent damage to equipment and injury to personnel. Observing safety precautions does not mean that all accidents will be prevented. It does mean that the number of accidents can be reduced.

If all safety precautions are observed and an accident resulting in damage to equipment and/or personnel injury occurs because of metal fatigue, stress, etc., it is not the fault of crew members. However, accidents caused by metal fatigue, stress, etc., account for a very small percentage of damages and injuries. Most damages to equipment and injuries to personnel are caused by poor maintenance practices and failure to observe safety precautions.

The primary reason for observing safety precautions is to _____

prevent damage to equipment and injury to personnel.

7. Safety precautions should be observed before and during the removal/installation of major units.
- ensure the proper operation of equipment.
 - ensure that a major unit is properly removed and installed.
 - complete a task in the minimum amount of time.

airborne search radar system trainer.

Which section of the MM gives step-by-step procedures for removal/installation of major units in the airborne search radar system trainer.

- a. Section I.
- b. Section V.
- c. Section II.
- d. Section IV.
- e. Section III.

9. Which section of the MM provides information about the location of the various major units?

- a. Section IV.
- b. Section V.
- c. Section III.
- d. Section I.
- e. Section II.

10. When removing and installing major units in the avionics system, the technician will be disconnecting numerous interconnects. Most cables have cable and/or plug numbers stamped on them. Some may even

connected. However, many tags and identification numbers and letters on cables and plugs are off or lost. When removing an unidentified it should be tagged to ensure proper reinstallation.

When removing and installing major units in an avionics system with unidentified cables, they should be tagged so as to ensure _____ of the cable or cables.

proper
reinstallation

11. The purpose of tagging unidentified cables when removing a major unit is to
- ensure proper reinstallation.
 - install new unlabeled parts from supply correctly.
 - ensure that they are not damaged.
 - ensure that they are not lost.

a.

12. The prevention of damage to equipment or injury to personnel can be accomplished by observing safety precautions before and during the reinstallation of major units in an airborne radar system.

during the removal/installation of major units to

- a. complete a task in the minimum amount of time.
- b. prevent damage to equipment or injury to personnel.
- c. ensure the major unit is properly removed/installed.
- d. ensure the proper operation of equipment.

13. Which section of the MIM gives the step-by-step procedures for removal/installation of major units.

- a. Section V.
- b. Section IV.
- c. Section III.
- d. Section II.
- e. Section I.

14. As a technician you will be required to remove major aircraft units that are found to be defective.

The first thing to do after removing the unit is to check it visually for physical damage including bent or broken pins and damaged jack connectors.

a note of this on the multicopy MAF that will accompany the defective unit to the Intermediate Maintenance Activity (IMA). The information pertaining to physical damage of a major unit help expedite the repairs to the unit.

IMA personnel can repair the bent or broken prior to applying power to the unit which would probably prevent burning up the test bench or further damage to the internal components of defective unit.

Upon removing a major unit from an aircraft avionics system the technician should visually inspect the unit for _____.

physical
damage

15. A technician visually checks a removed major unit for _____
(physical damage/shorted components)

physical
damage

16. Upon removing an unidentified cable, from a unit in an avionics system, tag it to ensure reinstallation of the cable or cables.

16. (Continued)

The purpose of tagging unidentified cables when removing a major unit is to

- a. install new unlabeled parts from supply correctly.
- b. ensure proper reinstallation.
- c. ensure that they are not damaged.
- d. ensure that they are not lost.

17. Safety precautions should be observed before and during the removal/installation of major units to

- a. prevent damage to equipment or injury to personnel.
- b. ensure the proper operation of equipment.
- c. complete a task in the minimum amount of time.
- d. ensure that a major unit is properly removed/installed.

18. During the removal or the installation of a major unit or aircraft equipment, all pieces of safety wire must be accounted for. Safety wire left on the flight line or flight deck can be caught in a jet blast and become a projectile as deadly as a bullet fired from a gun. It can inflict serious personnel injury or damage to equipment or aircraft.

18. Accounting for all pieces of safety wire wi
injury to personnel and damage to aircraft
associated support equipment caused by these
pieces of safety wire.

Pieces of safety wire should be accounted for
removal from equipment primarily to prevent

damages to
equipment and
aircraft and
injury to
personnel.

19. Pieces of safety wire should be accounted for
removal from equipment primarily
- to be reused.
 - to keep the aircraft neat and to conserve
safety wire.
 - because used safety wire must be turned
supply to get new safety wire.
 - to prevent damages to equipment and air
and injury to personnel.

d.

20. When a technician removes a major unit that
defective, the first thing that should be done
to visually check the unit.

A technician visually checks a removed major unit for

- a. unit malfunctions.
- b. physical damages, bent or broken pins, and damaged connectors.
- c. shorted components.
- d. equipment security.

21. The purpose of tagging unidentified cables when removing a major unit is to

- a. ensure that they are not damaged.
- b. install new unlabeled parts from supply correctly.
- c. ensure that they are not list.
- d. ensure proper reinstallation.

22. When a technician is sent out to the flight line to install a major unit in an aircraft, he must be sure the unit is installed properly: all unit mounts must be attached and tightened down and safety wire must be used in key areas where vibration and

stress are factors. Most major units of a system installed in an aircraft, that must be removed and reinstalled frequently utilize a wing-nut type of fastener. The wing-nut must be safety wired each time the unit is installed in the aircraft. Two examples of this are the Display-Indicator and the Electronic Control Amplifier units in the Airborne Search Radar Trainer, Device 15A21. Figure 2-5 in the MIM depicts this type of fastener.

Proper installation with all cables connected to their proper jacks does not necessarily ensure that the system will work. It is possible to receive a bad unit from supply, or a box may fail to operate properly because of impedance mismatching. However

22. (Continued)

if the unit is properly installed in the system and secured, the chances are minimized of its breaking loose and causing damage to the aircraft, its associated equipment, or injury to personnel.

Properly installing and securing avionics equipment and other aircraft equipment will help prevent damage to _____, _____, and injury to _____.

23. The technician should properly install major units in an aircraft to

- a. give quality assurance personnel free time for other tasks.
- b. prevent electrical/electronic malfunctions during flight.
- c. ensure the functioning of all auxiliary equipment.
- d. prevent injury to personnel and damages to the aircraft and equipment.

24. Loose safety wire can become a hazardous missile.

Therefore, all pieces of safety wire must be accounted for when removing aircraft equipment to prevent damage to equipment and aircraft or injury to personnel.

Remove from equipment primarily

- a. because used safety wire must be turned supply to get new safety wire.
- b. to be reused.
- c. to prevent damages to equipment and aircraft injury to personnel.
- d. to keep the aircraft neat and to conserve safety wire.

c.

25. A technician visually checks a removed major

- a. equipment security.
- b. shorted components.
- c. unit malfunctions.
- d. physical damages, bent or broken pins, and damaged connectors.

d.

26.

The technician should properly install major units in an aircraft to

- a. prevent electrical/electronic malfunctions during flight.
- b. prevent injury to personnel and damages to the aircraft and equipment.
- c. ensure the functioning of all auxiliary equipment.
- d. give quality assurance personnel free time for other tasks.

27. Pieces of safety wire should be accounted for upon removal from equipment primarily

- a. to keep the aircraft neat and to conserve safety wire.
- b. because used safety wire must be turned into supply to get new safety wire.
- c. to be reused.
- d. to prevent damages to equipment and aircraft or injury to personnel.

28. The technician should properly install major units in an aircraft to

- a. prevent injury to personnel and damages to the aircraft and equipment.
- b. ensure the functioning of all auxiliary equipment.
- c. prevent electrical/electronic malfunctions during flight.
- d. give quality assurance personnel free time for

a.

At this point, you may take the lesson to progress check. You may find it beneficial to review the objectives for this lesson topic. If you answer all self-test items correctly, proceed on to the next lesson topic. If not, seek help or use another medium of instruction, narrative or video consultation with the learning supervisor. If you can answer all self-test items on the progress check correctly (achieve lesson topic learning objectives) and then proceed to the next lesson topic.